1921 Vol. XLVIII OCTOBER 18th, 1945

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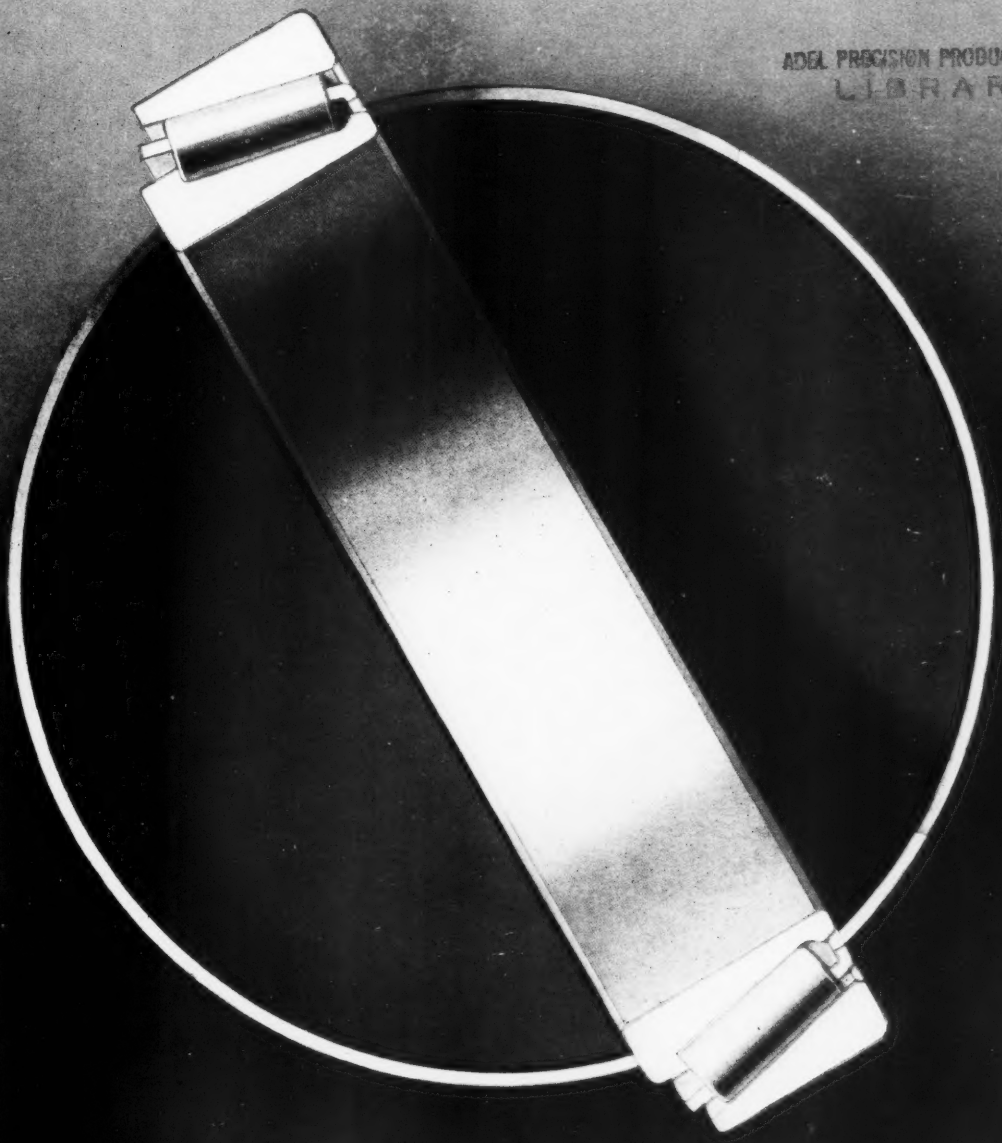

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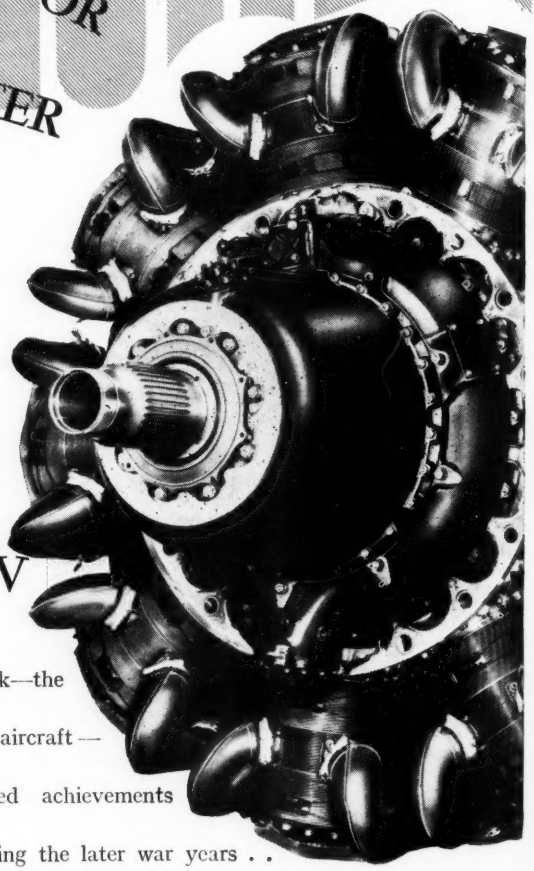

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FLIGHT
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AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Hurn for London

IT has become something of a habit to think of the temporary shortcomings of our air transport in terms only of available aircraft. All, it is felt, will be well as soon as our new civil aircraft are in full production and we have ceased to rely on conversions and on the overworked remains of a peacetime fleet.

True enough, new and better aircraft are badly needed, and the operations are being largely kept going at present by the enthusiasm and energy of air and ground staffs. The three Boeing 314 Clippers, for instance, bought by B.O.A.C. in 1941, have recently been making four Atlantic crossings a week between them. But the shortages start at ground level, and even if it were possible to obtain any number of suitable civil types for immediate service we should still find it difficult to make the best use of them.

The foundation problems for B.O.A.C. are those of base organisation and equipment. In fact, it can hardly be considered that the Corporation *has* any suitable base from which to work. Hurn is not a bad airfield as airfields go, but it was laid out on Service dispersal lines, has inadequate hangar accommodation, and, though conveniently placed for some purposes in relation to the boat terminal at Poole, is unsuitable even for short-period operations. In peace conditions it might be possible to make it temporarily usable, but work on buildings and hard standings is delayed indefinitely with the low priority obtainable for such work. During the winter months it will be muddy and uncomfortable both for the staff and, more important still, for the passengers. And it is geographically ridiculous with a long combined bus and train journey to and from London.

Surely something better can be offered by the Air Ministry, even as a temporary measure, and until Heath Row is "civilised" and made ready for occupation in the still distant future? It is almost as if the non-civil side of the Ministry were trying, for some obscure reasons of its own, to freeze the country's air transport-operating company to a standstill. Croydon, of course, though still used for certain types by the Corporation and, in particular, for the Irish Sea run to connect with the Atlantic services, is, with Heston, out of the question for any serious future services with modern aircraft.

The few suitable airfields are used by the R.A.F. or U.S.A.A.F., but surely one can be spared, and the most obvious, from all points of view, is Northolt. It is nearer than any other to the centre of London, it is well placed from the transport angle, it is on the "good-weather" side of the city, and it is big enough for present purposes. No doubt the Air Ministry have good reasons for wishing to retain it as their own exclusive property, but we cannot feel that these reasons are good enough when the immediate prestige of our civil airline is at stake. Prestige can be easily lost, but is very difficult indeed to regain.

A Survey and a Programme

THE 21st Army Group was the subject of the lecture delivered recently by Field Marshal Montgomery to the Royal United Service Institution. The Allied Air Force in Europe was under the supreme command of General Eisenhower, but did not form part of the 21st Army Group, and consequently only came in for incidental mention.

There were, however, two types of air operation on which it was in order for the Field Marshal to express his own opinion, as they came under his command. These were the use of airborne troops and the part played by Air O.P. in the artillery side of the fighting. The battle of Arnhem, he said, came very near to complete success, but the weather was against the Allies from the

start of the operation. He said that airborne forces must now form an essential part of the Army, as there will often be occasions on which they can play a vital role. The use of these airborne troops is limited in mobile operations, chiefly by the uncertainty of the weather. But in deliberate operations, such as the seaborne assault or the crossing of a major river, airborne troops have proved to be "a battle-winning factor."

The Air O.P.

THE words Sir Bernard used about the Air Observation Post are worth quoting in full. He said: "The Air O.P. has proved its value in this campaign. It has become a necessary part of gunnery and we must press for a good aircraft for the job. Very good R.A. officers are required for duty in the squadrons, and they must be selected with this in view. Primarily, an Air O.P. officer must be a good gunner—it is not difficult to teach him to fly."

The opinion that we have heard expressed is that the Auster (about which a special article appears in this issue) was very good for the job of spotting for the guns. It was easy to fly, very robust, very manœuvrable (though slow), and gave a very good view to the gunner officer who flew it and acted as observer. But there is no class of aircraft on which an improvement is not possible. That the flying abilities of the pilot are subordinate to his duties as observer was recognised at the Old Sarum School of Army Co-operation many years ago. It was insisted that the piloting must be and could be instinctive, and that the observer should concentrate his attention on what he saw below him.

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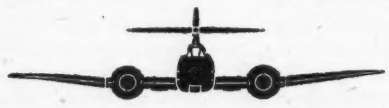
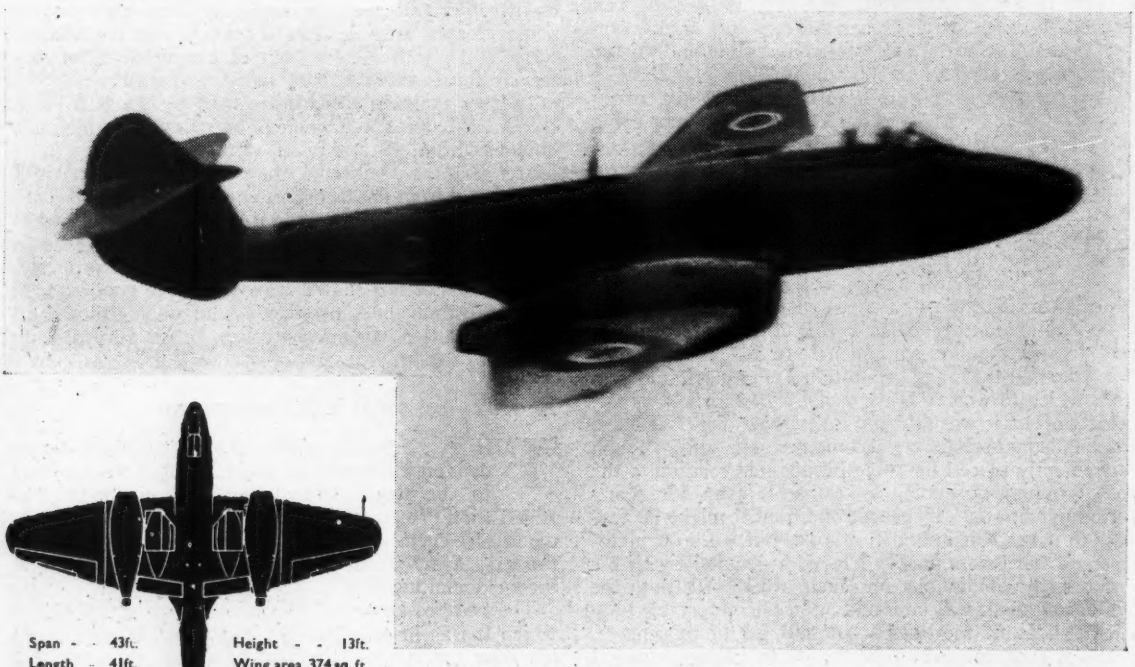
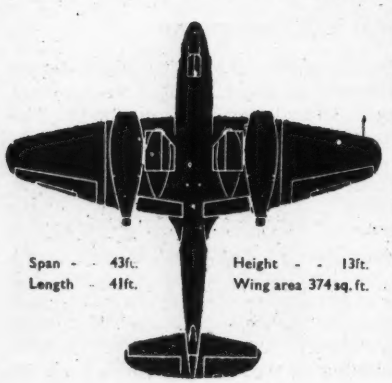
The Speed Record

TEN miles a minute appears to be a possible "target" for the world's speed record attempt about to be made by Gloster Meteors. Only a few years ago this would have been regarded as fantastic. To-day we have become blasé, and 600 miles per hour fails to impress as it should. For it is a tremendous achievement, and there is no reason to doubt that it, or something very near it, will be recorded.

Mention of the 600 m.p.h. figure reminds us that international records are measured in metric units, so that a "target" of 1,000 km. per hour would be more logical. That, however, would represent 621.37 m.p.h.







RECORD ATTEMPT WITH JET FIGHTER: Within the next few days it is expected that an attempt on the world's speed record will be made by the Gloster Meteor. A slightly modified version of the Meteor III will be used, powered by Rolls-Royce Derwent gas turbine engines. Further details of the attempt appear on page 419.

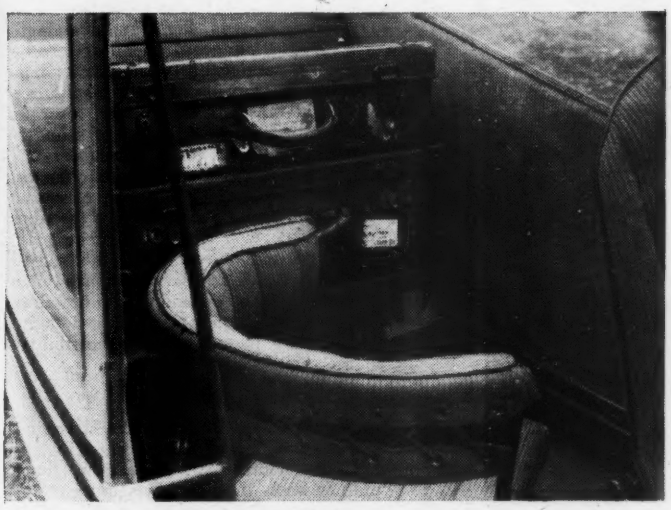
Civil Auster

Robust, Neat and Attractive Light Plane Now Available to Private Owners and Clubs

THE cessation of war has inevitably led to the consideration by enthusiasts in the flying world as to when, on what basis, and with what aircraft civil flying for the individual is likely to be resumed. We take it as a harbinger of pleasant times to come that Taylorcraft Aeroplanes (England) Limited, of Leicester, are now in production with a three-seater civil version of the famed Auster which did such yeoman service on widespread and varied battlefronts during the war years.

Mention of the new Auster has already been made in *Flight* together with the fact that the purchase price has been fixed at the very reasonable figure of £825. We have now had the opportunity to inspect one of the new machines, and a very impressive little aircraft it is.

Basically, the airframe and general structural details are the same as those of the military Auster, but the seating has, of course, no armourplate and is of different design. The seating arrangement has the two front seats side by side, with the third rear seat set facing athwartships and slightly rearward so that the occupant is looking to port and slightly aft. This seating position is by no means so uninteresting and unattractive as it sounds on the surface, for the very extensive side windows, coupled with the Perspex coupé roof which extends over the whole cabin, give a really magnificent field of view which, by itself, renders the aircraft extremely attractive. Further, there is a great deal of very useful space in the aft portion of the cabin where, in addition to a third person, at least three full-sized suitcases may be carried.



In addition to a passenger in the rear seat, three full-sized suit-cases can easily be accommodated.

Interior Quality

Interior appointment is of fair quality, but is not at all luxurious. This must not be taken as a reflection on the aircraft, because the extremely reasonable purchase price has only been made possible by cutting out frills and fancy items. There is no doubt that the quality of the interior finish is quite adequate for all reasonable people; but the person who wants something more opulent will need to have a proportionally deeper pocket. Far more important than sumptuous appointment is, in the minds of most potential private owners and club authorities, the ability of the aircraft to be flown safely without effort and also the ability to withstand an occasional hard knock. Aircraft as a general class are expensively fragile things at best, but it must be appreciated that this machine has a native robustness that will permit it to accept as an everyday occurrence treatment which in the general run of machines would necessitate quite expensive restorative attention.

This robustness and ability to take really rough treatment as an everyday event is one of the most impressive single aspects of the Auster, and it was this quality, probably more than any other, which led to its adoption by the Army authorities as an Air Observation Post, for this type of work is extremely hard on a light aircraft. Prior to military adoption, two production line machines were given intensive trials consisting mainly of short flights with as many landings as possible being made in all types of fields, the idea being to simulate very closely the actual conditions in which the aircraft would be used in battle operation.

The first Auster made a total of 1,110 landings during the test, and the second machine 1,212 landings, all at the maximum permissible

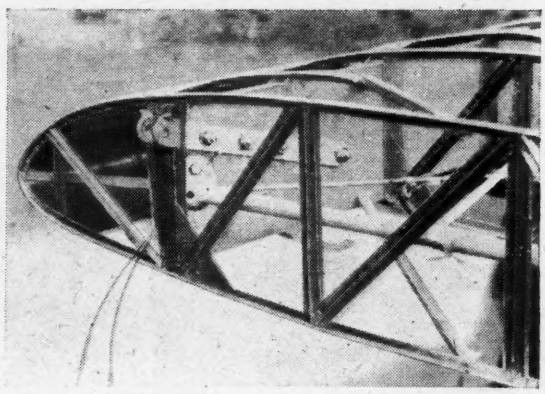
CIVIL AUSTER

all-up weight of 1,400 lb., with both aircraft cramming 150 hours' flying into two weeks. In one abnormally heavy landing one undercarriage leg was damaged and had to be changed, this being carried out in the open within three hours. After the new leg had been fitted a further 884 landings were completed without incident. It is, of course, obvious that trials such as these should impose the most rigorous conditions on the whole machine, not just its landing gear, and it says much for the Auster that both the aircraft tested came through the trials with flying colours.

Structure

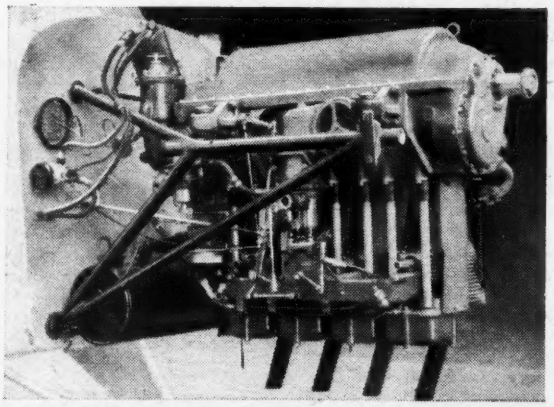
Primarily, the airframe is an all-metal structure, although the cabin floor, main-plane and tailplane spars and a few fuselage stringers are of wood. Tubular members of 45- and 35-ton steel made in various gauges and diameters are welded together to form a girder-braced structure to compose the fuselage. Wing structure is simple and orthodox and comprises two laminated wooden spars to which are attached warren-girder braced ribs of Birmabright spaced at about 15in. intervals. Drag bracing between spars comprises cross wires, and tie tubes at about 30in. intervals throughout the span. The leading-edge nosing is light alloy covered, and the six inboard ribs are recessed on the underside of the trailing edge for accommodation of the split flaps. Flap hinges are carried on cantilever brackets off the rear spar as are the aileron hinges.

Wing-to-fuselage attachment is by fork-end strap-fittings through-bolted on the inboard end of each spar, the fork-ends picking up with lugs on the fuselage structure and each joint being secured by a single bolt. The V-strut wing braces have a similar pick-up to the fuselage at their lower ends, the upper attachment being in light channel-members on both sides of each spar; additionally, the V-bracing is stabilised beneath the wing by a vertical and horizontal tie-tube assembly. Fin structure is integral with the fuselage, and the tailplane is similarly of welded tube framework, each side being attached by a simple socket joint secured with a single bolt front and rear. Rudder and elevator structure is also tubular, all tail unit surfaces being of the flat-plate type; that is to say, they are parallel sided without camber.

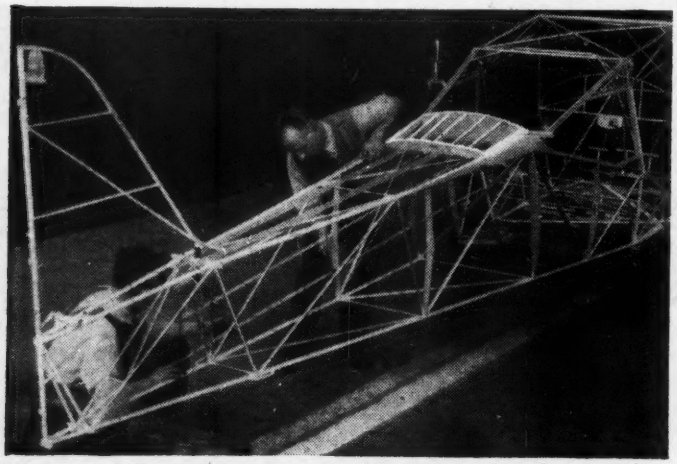


This detail shows rib structure, drag-ties and cross-bracing together with strap-fork for attachment to fuselage.

Initially, Austers had a subsidiary horizontal surface beneath the tailplane which could be adjusted for incidence during flight and so provide trimming in pitch. On the civil version this auxiliary surface has been deleted and instead a conventional trim tab fitted in the trailing edge of the port elevator. The control for tail trimming is fitted in the roof of the cabin where it is accessible from both seats and is also out of the way. However, we cannot help feeling that a trim control operated in the natural plane and sense of the result required would be rather more convenient. It should not be difficult to fit this between the front seats above the undercarriage "bungee" anchorage.



The Cirrus Minor Series II engine carried on its sturdy mounting makes a neat installation.

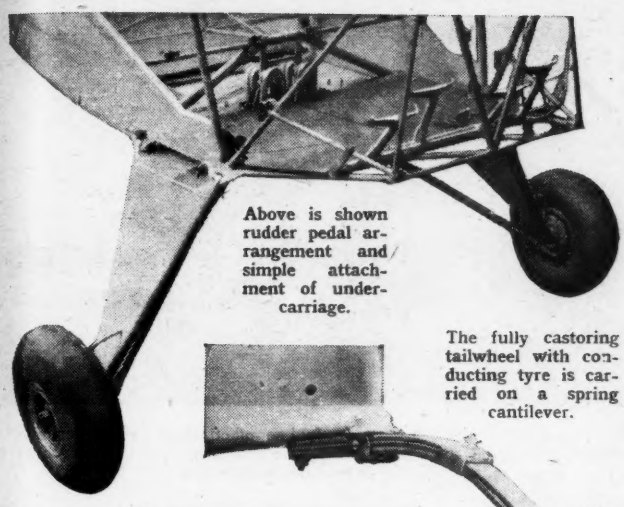


Fitting the wooden stringers on the metal airframe for attachment of the fabric covering.

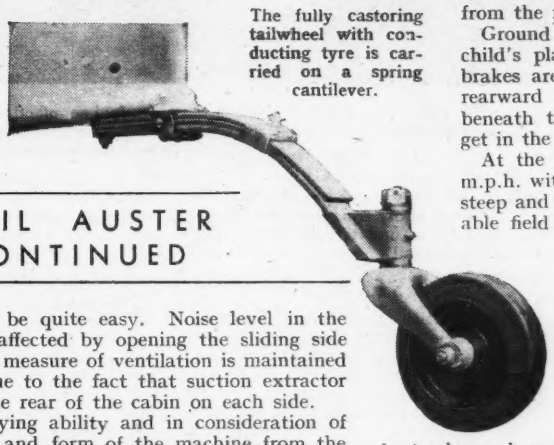
On the score of serviceability the Auster has a deal of advantage over many other machines; being an all-metal, fabric-covered aircraft makes it ideal for use in extremes of climate where such form of structure is not subject to deterioration from rapid temperature changes or high humidity. In addition, the absolute simplicity of the aircraft makes it a ground engineer's joy, as well as being peculiarly fitted to the particular needs of the average private owner. All critical points are open to inspection by the embodiment of zipp fasteners in the fabric, and the quickly detachable engine cowling panels makes accessibility to the engine wonderfully good.

Noise Level

The Blackburn Cirrus Minor Series II engine is very smooth and, even without silencing, is quite quiet. In point of fact the noise level in the cabin is such that conversation can be carried on in a slightly raised voice, whilst with an exhaust system incorporating a silencer, conversation in little more than



Above is shown rudder pedal arrangement and simple attachment of undercarriage.



The fully castoring tailwheel with conducting tyre is carried on a spring cantilever.

CIVIL AUSTER CONTINUED

normal tones should be quite easy. Noise level in the cabin is, of course, affected by opening the sliding side windows, but a good measure of ventilation is maintained with these closed, due to the fact that suction extractor vents are fitted at the rear of the cabin on each side.

On the score of flying ability and in consideration of the general handling and form of the machine from the pilot's point of view the Auster is a very satisfying little aircraft. Seats are comfortable, and even for a person over 6ft. tall there is a surprising amount of leg room. All-round visibility is really quite extraordinary, particularly rearwards and upwards, due to the Perspex cabin roof. Forward visibility is as good as a single-engine tractor installation can allow, whilst sideways and downwards visibility is of a high order. A disadvantage of high-wing designs is that in fairly steep turns a considerable area of view on the inside of the turn is blanked off by the wing, but this is mitigated to a certain extent in this aircraft by virtue of the Perspex roof, whereby, in a steep turn, one can gain a certain measure of view through the roof of the cabin.

The aircraft has a high level of inherent stability and is extremely responsive to all three controls, as well as being quite manœuvrable within the limits imposed by a high-wing layout.

Stalling is straightforward and gentle with no marked tendency to drop a wing, and the speed is almost ridiculously low; with flaps up the stall occurs at about 38 m.p.h. I.A.S. (at max. all-up weight), whilst with full flap the stalling speed is brought down to 29 m.p.h. I.A.S.

Flap actuation is by a horizontal lever mounted fore and aft above the left door, the lever being pulled down and notched into three separate positions for take-off, intermediate and full-flap settings respectively. Change of trim with application of flap is very moderate, and negligible sink is experienced with selection of flaps up.

Dual control is provided and standard instrumentation includes r.p.m. indicator, air speed indicator, turn and bank indicator, altimeter, pitch indicator, oil pressure gauge and fuel gauge. These at present are grouped to the left of the facia panel with a likelihood that they will subsequently be arranged centrally so as to be equally visible from either front seat. The fuel cock control, mixture control, Ki-gass priming pump and the throttle are centrally arranged beneath the instruments, whilst a P6 reflecting compass is mounted centrally in the roof. In consideration of the control layout, although the cranked control columns are perfectly effective and allow of an unobstructed floor, we feel that many people might prefer the original Taylorcraft layout of a push-pull horizontal shaft terminating in a wheel. It might be advantageous if this were offered as an alternative, particularly in view of the throttle being centrally mounted, as for some reason or another changing hands during take-off (as is necessary with a central throttle) seems to be less of a trial with wheel control. It might also be a good thing if an alternative throttle position on the left of the facia panel were offered in conjunction with the central throttle, this being particularly applicable for club machines where relatively little difference would be noticed by the novice with change-over from the right to the left seat.

Ground handling of the Auster is absolute child's play. The mechanically actuated wheel brakes are operated from two small pedals just rearward of the rudder pedals where they are beneath the pilot's heels, yet curiously do not get in the way for ordinary rudder control.

At the ordinary approach speed of about 45 m.p.h. with full flap, the glide path is reasonably steep and the nose-down attitude gives a remarkable field of forward view. Sitting the aircraft down at about 25-30 m.p.h. and applying the brakes allows the machine to be brought to rest in a distance of about 50 yards. A pistol-grip pull-on parking brake is fitted beneath the left extreme of the facia panel and operates the wheel brakes by a Bowden cable tightening wire bridles attached to the brake pedals.

Austers are available in two standard colour schemes: cream with green flashings or cream with maroon flashings, the upholstery and colour scheme of the cabin being green or maroon respectively in each case. Upholstery and cabin lining is carried out in Bedford cord which, whilst being an extremely durable fabric, is also of pleasing appearance. Lap type seat harness is fitted and commodious pockets are included on each door.

To sum up, the Auster is undoubtedly an aircraft with a very healthy future among private owners and the clubs; its cheapness, robustness, complete simplicity of handling and minimum of maintenance put it in a class where, at the moment, it is quite unrivalled.

TAYLORCRAFT AUSTER J.I.

Span	36ft.
Length	23ft. 4in.
Height, tail down	6ft. 6½in. to wing tip.
Wing area	184.5 sq. ft. gross.
Aspect ratio	7 : 1.
Dihedral (mean aerodynamic)	1 deg.
Incidence	3 deg. 45 min. at 20in. outboard of centre line.
Tailplane span	10ft.
Tailplane and elevator area (gross)	24 sq. ft.
Fin and rudder area (gross)	12.25 sq. ft.
Flap area	8.5 sq. ft. per wing.
Gross weight	1,785lb. normal 3-seater. 1,850 max. permissible.
Wing loading	9.67 lb./sq. ft. } at 1,785lb.
Power loading (take-off)	17.85 lb./B.H.P. } at 1,785lb.
Max. all-out speed	125 I.A.S. at 1,000ft.
Normal cruising speed	100 I.A.S. at 1,000ft.
Climbing rate	610 ft./min. at M.S.L. at 1,700lb.
Stalling speed, power off, flaps down	29 I.A.S. at 1,700lb.
Stalling speed, power on, flaps down	26 I.A.S. at 1,700lb.
Absolute range	289 miles (normal tankage) 15 galls.
Absolute ceiling	15,000ft. approx.
Service ceiling	13,400ft. approx.

Engine: Blackburn Cirrus Minor Series II, four-cylinder inverted, air-cooled.

A. Max. power	100 B.H.P. at M.S.L.
B. Max. normal continuous power	74 B.H.P. at M.S.L.
C. Max. economical cruising power	53.8 B.H.P. at 1,000ft.
D. Normal climbing power	93 B.H.P. at M.S.L.

Fuel Consumptions:

A.	7.5 G/HR	0.075 G/HP/HR	14.68 AMPG
B.	5.2 G/HR	0.0703 G/HP/HR	17.6 AMPG
C.	4.16 G/HR	0.0773 G/HP/HR	19.25 AMPG
D.	6.93 G/HR	0.0746 G/HP/HR	(N.A.) AMPG

HERE AND THERE

TIP TO TIP : The wings of the Sea Mosquito fold compactly back over the cockpit for carrier stowage. Normal span is 54ft. 2in. and length 41ft. 7in. Wing area is 440 sq. ft. Further details are on page 416.

Home by Lancaster

OVER 51,200 Service passengers have been carried safely to and from this country during the last nine weeks on R.A.F. Bomber Command's transport and freight services operating Lancasters between Italy-U.K., and Berlin-U.K.

Most of the passengers have been Army personnel, and of these 46,011 have been brought back from Italy either as "repatriates" or on leave. Over 3,900 have returned to Italy by air.

G.A.P.A.N. "At Home"

LORD WINSTER, the Minister of Civil Aviation, has intimated that he would welcome an opportunity to meet the Guild of Air Pilots and Navigators, and an "At Home" has therefore been arranged by the Guild for this purpose.

It is to be held at 6 p.m. at 4, Hamilton Place, W.1, on Thursday, November 8th, and will be preceeded by an extraordinary general meeting of the Guild, at the same premises, called for 5.15 p.m. on that day.

British Empire Lecture

THE first of the British Commonwealth and Empire lecture series founded by the Royal Aeronautical Society last year is to be given by Mr. Hudson Fysh, managing director of Qantas Empire Airways, and his subject will be "Australian and Empire Air Transport."

This lecture was originally announced for Thursday, November 15th, at the Institution of Mechanical Engineers at Storey's Gate, St. James' Park, S.W.1, on the lecture programme card circulated by the R.Ae.S. and announced in *Flight*, October 11th. But the time and place has now been changed to 6.30 p.m. on Tuesday, November 13th, at the Institution of Electrical Engineers, Victoria Embankment.

Accent on Sport

THE value of sports of all kinds in A.T.C. training is universally appreciated, but it may not be generally realised how much effort is put into this side of the Corps' activities, nor how well organised it now is.

The "Sports Review and Souvenir, 1945," recently issued by Eastern Command, A.T.C., of which Air Marshal Sir Patrick H. L. Playfair is Commandant, serves a two-fold purpose, therefore; it provides a useful summary of the Command's own sporting progress, and it gives a good indication of the high standard achieved in this field throughout the Corps as a whole.

This attractively presented booklet makes it clear, also, that the formation last spring of a central "sports board" proved a boon in co-ordinating the efforts of the many squadrons among the scattered towns and villages of this particular Command.

S.E.S.A.

THE Scottish Engineering Students' Association has now been formed with offices at 420, Sauchiehall Street, Glasgow, C.2, and membership is limited to the "under thirty" members of recognised technical institutions and societies.

Its chief object is to enable young men in all branches of engineering to get together on a social basis and swop ideas and views, and there is no subscription fee, the funds being provided by prominent Scottish engineers and shipbuilders.

Meetings of various kinds and social functions are being arranged, and Sir Harold Yarrow gave his presidential address last Thursday night at the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow, C.2.

Three 230 gal. fuel tanks slung in the bomb bay gave the Halifax IIIa a 2,750 miles range for pin-pointing Jap radar stations. Liberators did the bombing. The airman is seen recharging the oxygen supply.

U.S. Training Casualties

FIGURES recently issued by the U.S. Navy Dept. in Washington show that in the course of training nearly 60,000 pilots and more than 40,000 aircrew from December 7th, 1941, onwards, 1,855 students, instructors and aircrewmen were killed in accidents.

Luckily accidents decreased with experience as shown by the fact that whereas from 1936 to 1941 the hours flown per fatal accident were 26,549, they rose to 38,300 hr. in 1944.

F.A.I.

AT the invitation of the Royal Aero Club, the first post-war general conference of the *Federation Aeronautique Internationale* is to be held in London in the autumn of 1946.

Actually the very first post-war meeting—though not a general conference—was held recently in Paris and it was here that the invitation was extended by the R.Ae.C., which was represented on that occasion by the Marquess of Londonderry, Capt. K. J. G. Bartlett, and Cdr. Harold E. Perrin.

At this preliminary meeting it was decided that the Federation should take over the functions of the "ISTUS," previously controlled in Germany, and among other questions discussed were the resumption of the carnet system for air tourists, free landings and hangarage facilities, and the reclassification of performances for records.

This Air Age

WHEN we were at school, mathematical problems designed to arouse our youthful interest often began with some such phrase as "If an express train leaves Paddington at 9.10 a.m.——" Or perhaps it might be "Two motorists leave London and Manchester respectively at 8 a.m.——"

Nowadays, however, the mathematical pill is coated with Cellon, and cerebral activity in the schoolboy is stirred by substituting the aircraft for the train and the motor car.

Questions on triangles of velocities as applied to the flight of aircraft are now being set in some school certificate

HERE AND THERE

examinations, and it is an eloquent sign of the times that, as clearly shown by an example before us, the modern schoolboy is credited at this stage with knowing the difference between true air speed and ground speed, and between course and track, as mere items of general knowledge and not as technical terms in the science of navigation.

French "Skycycle"

M. CHARLES TILLON, French Air Minister, announced last week that mass production of a 40 h.p. "baby" aircraft will be started in France as soon as shortage of materials and airfields is overcome.

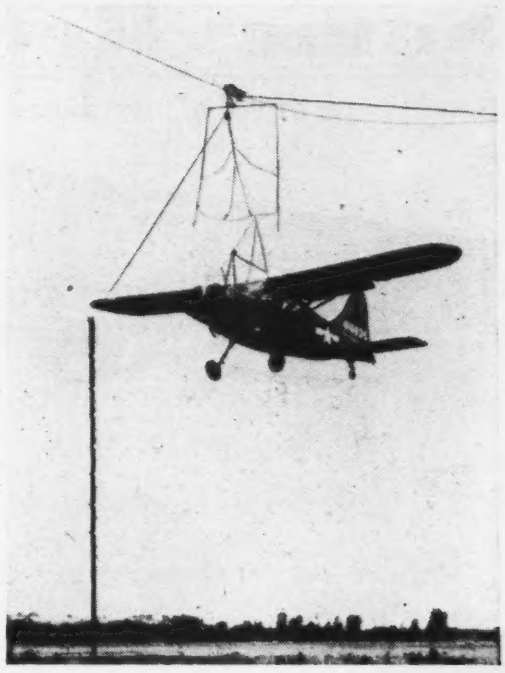
This is part of a plan to build three types of tourist aircraft, the others being a four-seater 200 h.p. machine with a cruising speed of 143 m.p.h. costing £2,500, and a two-seater of 140 h.p. with a cruising speed of 131 m.p.h. costing £2,000.

A New Office

SIR ARTHUR WILLIAM STREET, who has been Permanent Under-Secretary of State for Air since 1939 and whose photograph appears at the foot of this page, has been seconded from his post to become the Permanent Secretary of a new office which the Government has decided to establish under the responsibility of the Duchy of Lancaster.

This new office will handle the affairs of the British element of the Control Commissions for Germany and Austria.

During Sir Arthur Street's absence, Sir William Brown will act as Permanent Under-Secretary for Air.



SUSPENSE! A cable "landing" system invented by Capt. J. H. Brodie of the U.S.A.A.F. was used towards the end of the war for A.O.P. types as shown here. After the plane has hooked the hanging loop a friction device brakes it to a standstill within the limits of the supporting cable.

News in Brief

AIR CHIEF MARSHAL SIR ARTHUR HARRIS returned to England last week after visiting South Africa and Rhodesia at the invitation of the two Governments.

* * *

The British Airline Pilots' Association has now moved its offices from the temporary wartime accommodation in Park Lane to new premises in Suites 5 and 6, 9-10, Marble Arch, London, W.1.

* * *

An aircraft designed specially to carry horses is reported to have been developed by the Fairchild concern. In addition to nine horses standing three abreast, the flying horse-box accommodates two stable boys and their gear.

* * *

The U.S. flying boat *Hawaii Mars*, which crashed into Chesapeake Bay during a test flight some weeks ago, is reported to have been salvaged and taken to the Martin Middle River plant for the cause of the accident to be investigated.

* * *

Reuter reported last week that, in the new R.A.F. two-way service which is taking Indian troops home and bringing British troops back from India, "scores of Dakotas, Stirlings and Liberators" are landing at Karachi at the rate of one every 20 minutes. A huge transit camp has been opened for the men at the airfield.

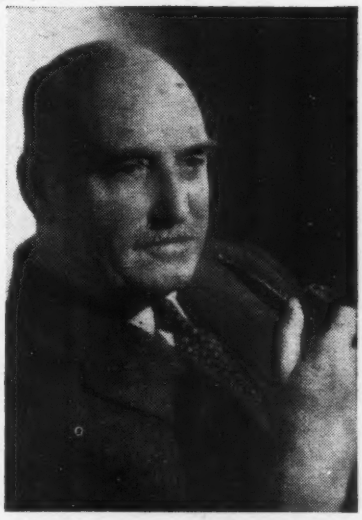
* * *

Mr. J. P. Herriot has joined the technical staff of Rolls-Royce, Ltd., as assistant to Dr. S. G. Hooker on gas turbine engines. Since 1940 he has been on loan to Rover and Rolls-Royce from M.A.P., where he had held an A.I.D. appointment since 1927, and has been concerned in the development of jet-propulsion units.

A W.A.A.F. corporal, who chanced to be the 100,000th passenger carried by a wing of R.A.F. Transport Command operating for Service personnel between Croydon and the Continent, was presented with a bottle of champagne on arrival at Croydon. With the wine she also received a "happy landing" letter and the congratulations of the C.O.

* * *

The Joint Aircraft Committee which was established on September 13th, 1940, and is believed to have been the first Anglo-American committee formed for World War II, has been dissolved by Mr. Robert P. Patterson, the U.S. Secretary of War, with the approval of the British Air Committee. It furnished the combined Anglo-American machinery for a continuous review of aircraft production, for standardisation in production, and for allocation of deliveries according to tactical requirements.



Sir Arthur Street, Permanent Under-secretary for Air, who has been seconded to a new Government office.

* * *

Passenger aircraft and airport buildings are among the many things which the Central Institute of Art and Design, of which Sir Charles Tennyson is chairman, wants to see planned and decorated in a manner likely to gain international prestige for British industrial art. The Institute is campaigning for an ambitious programme to make Britain the art centre of Europe.

* * *

The entire share capital of Kent Alloys, Ltd., has been purchased by Dawney, Day and Co., Ltd., but the policy of the former will remain unchanged under the general-managership of Mr. F. H. Hoult. The sale was sanctioned by the Ministry of Supply and Aircraft Production after a recommendation by the board of Short Brothers, Ltd.

* * *

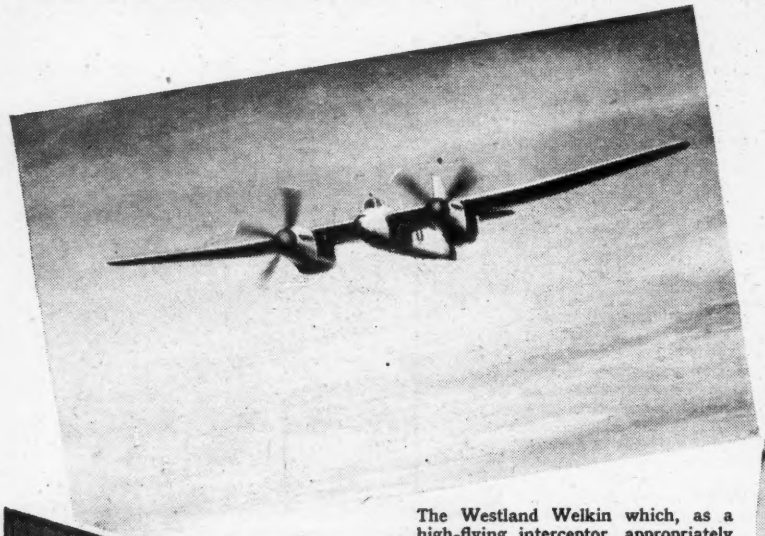
Lt. Gen. Sir W. G. Lindsell has been appointed by the Government to secure the orderly release of requisitioned factory space now urgently needed for the expansion of home and export trade to provide full employment. Among 24 more Government factories recently allocated to manufacturers is one on the Watford By-pass, in which Savage and Parsons, Ltd., will produce electrical equipment, and one at Walton, Liverpool, acquired by D. Napier and Son, Ltd., and the English Electric Co., Ltd., for the manufacture of aircraft engines and for electrical engineering.

D

Some Recent Releases

New Photographs of the Latest British Civil and Military Aircraft Types

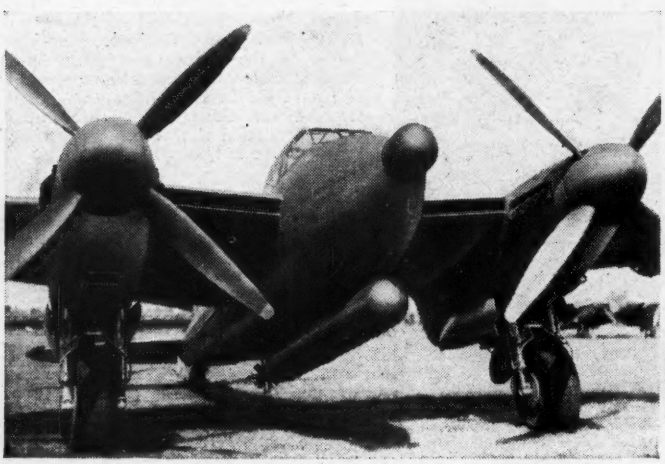
Torpedo/Bombers, Fighters and Post-war Airliners



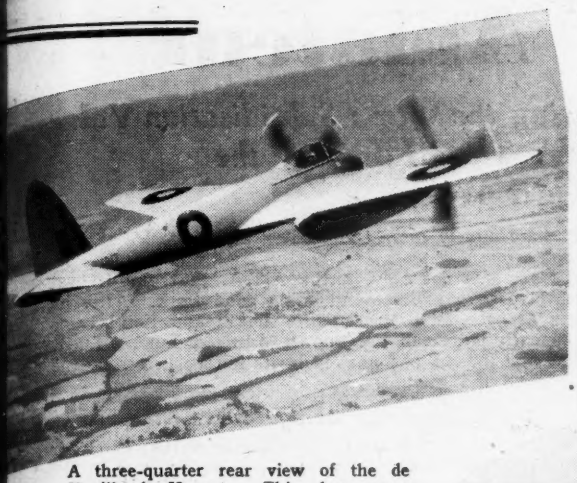
The Westland Welkin which, as a high-flying interceptor, appropriately occupies the top of the page. This single-seater has a wing span of 70ft. and is powered by two Rolls-Royce Merlin engines of 1,650 h.p. each. A pressure cabin is fitted.

Designed for feeder line work, the de Havilland Dove is a replacement of the well-known Dragon Rapide. It is an eight-ten seater powered by two 340 h.p. de Havilland Gipsy Queen engines.

A 2,050 h.p. Griffon-engined Spitfire XXII being put through its paces above the cloud layer. As distinct from the Spitfire XXI the XXII has a bubble canopy.

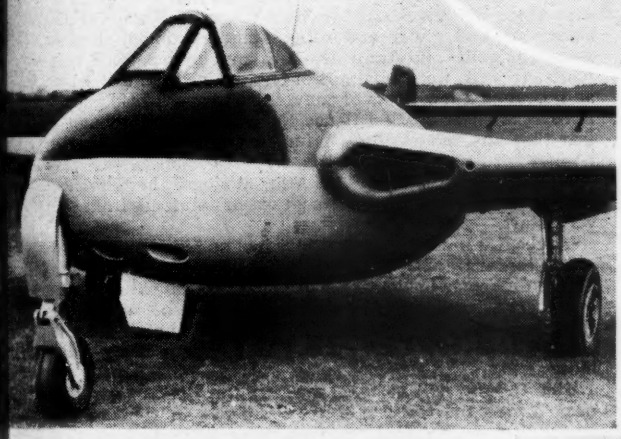


(Left) Radar equipment accounts for the peculiar nose on the Sea Mosquito. In addition to the torpedo and the usual four 20 mm. cannon, rocket projectiles can be carried. (Above) A 21-seater Vickers Viking demonstrates how it can fly on one of its Bristol Hercules 1,675 h.p. engines.



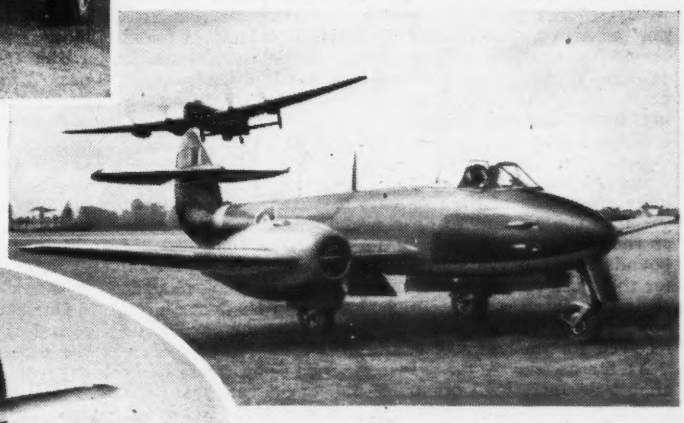
A three-quarter rear view of the de Havilland Hornet. This long-range fighter has a top speed of over 470 m.p.h. The engines are Rolls-Royce Merlins of 2,070 h.p.

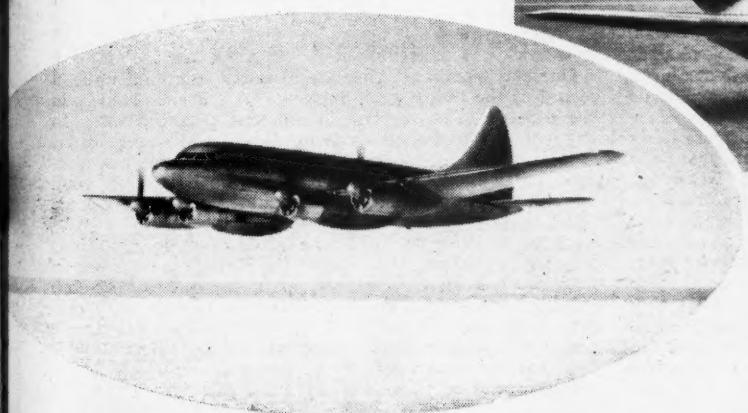
Two single - seater Blackburn Firebrands flying in formation. These Bristol Centaurus-engined "strike aircraft" can carry either a torpedo or bombs or rocket projectiles. The torpedo weighs 850 lb.



A Miles Monitor II flies with one of its Wright Cyclones stopped and the airscrew feathered. The Monitor II was designed as a high-speed target-towing aircraft for the Royal Navy. It is capable of towing a sleeve target at over 250 m.p.h. Its top speed is 360 m.p.h. To simulate dive bombing attacks on ships it is intended to fit dive brakes on production aircraft.

This close-up of the de Havilland Vampire clearly shows the retractable nose wheel with its anti-shimmy tyre, the gun ports in the fuselage and the port air intake for the de Havilland Goblin gas turbine.





Three from the Hawker Group. (Above) An Avro Lincoln flies over a Gloster Meteor taxying out to the take-off point. During the war the Lincoln carried the heaviest bombs dropped by any of the belligerents and as we go to press the Gloster Meteor is being prepared to make an attack on the World's speed record. (Left) The Merlin-engined Avro Tudor I which is the civil counterpart of the Lincoln. The Tudor was the first of Britain's post-war airliners to reach the flying stage.

"Indicator" Discusses Topics of the Day

Salute the Amateur

The Work of the Club-trained Pilot During the War : Subsidisation Value Returned in Good Measure : The Halt and the Maimed Show Their Worth

IF and when the Treasury and the Air Ministry come round to the point of considering a renewal of the subsidy arrangement for the encouragement of amateur flying clubs, somebody should be there to remind them of the work done during the war by the genuine amateurs. Judging from remarks which have fallen from time to time in high quarters, I am afraid that the word "remind" is nothing much more than an euphemism, and is used from a sense of politeness. I don't think "they" have more than a very small idea of the work that has, directly and indirectly, been done by the amateur.

In the early days of the near-war a refusal to be interested in the potential value of club-trained pilots for non-operational work was quite understandable, and, considering the paucity of the flying done by pilots under the C.A.G. scheme, it is not surprising that those very letters stank in the nostrils of those responsible for the training of war pilots. To an operational pilot the ability to fly is a very small thing, and a few hours in a light aircraft are valueless except as an indication that an individual is both teachable and keen.

But there were, in the background, quite a considerable number of club veterans, most of them over-age for operational duties and many of them unfit by Service standards, who might well have been forgotten altogether, and never used at all, if the A.T.A. had not been formed and if the Fleet Air Arm had not found itself so woefully short of pilots.

Admittedly, the Air Ministry itself suddenly came to life in, I think, September, 1939, and offered V.R. commissions to pilots over the operational age-limit and with a certain reasonable flying experience; instructors were wanted, and the Air Ministry was primarily interested in ex-R.A.F. personnel and ex-club instructors. The smaller fry were still left in the stream, and the medical standards were as high as ever. Many enthusiastic volunteers found themselves in the R.A.F. on ground duties, their hundreds of club-flying hours forgotten and unused, in the days when experienced pilots were badly needed for ferrying, instructing, testing and drogue-towing.

Value for Money

Despite the restrictions and difficulties, I think a very large proportion of the amateurs managed, eventually, to get into the air and to do a useful job of work in spite of those who had seemingly forgotten the thousands of pounds spent in the subsidisation of clubs. But it was, for the most part, through their own unaided efforts that their experience was put to good use, and I wonder, even now, whether the Air Ministry fully realises the good value received for the years of subsidy.

As far as the A.T.A. is concerned—now regrettably almost defunct, its work over—the bread cast upon the waters was certainly returned a thousandfold. Nearly all the original members of that organisation were true-blue amateurs, and, before going to work and finding out for themselves, were given the barest sort of conversion courses to fit them for the job. They coped through sheer common sense, because they were not young enough to be over-dashing, and because their sometimes-despised club training was basically sound. If one keeps one's wits about one, aircraft are all very much the same, and the jump from a Puss Moth to a Spitfire, or from a Dragonfly or Monospar to a Lancaster, is largely a psychological one. In the end, a flying machine is just a flying machine—some are merely more complicated and more lethal than others.

But it was not only in the A.T.A. that club-trained amateurs were to be found doing good work. After its early struggles for bare existence, that organisation became sufficiently large and well known to be remembered for its work and for the part played in its initial success by the subsidised flying clubs.

In Fleet Air Arm and A.T.A.

In the R.A.F. and, more particularly, in the Fleet Air Arm, the ex-amateurs were quietly going to work in the air, while several of our best-known civil test pilots are civil-trained and might never have got into the air at all if it had not been for the clubs. I don't know how many instructors in the Air Force come into this category; many of them were civilian reservists, and all, presumably, were re-trained by the Service, but the basis of their experience was civilian in texture. Nor do I know how many tug and glider and other non-operational aircrew were originally club-trained. Two or three Service test pilots, at least, were amateurs or civil-trained professionals, and, beyond a few hours of conversion to specialised types, have been sheer credit balance to the Treasury, though I fear that any request for a refund of training costs would be met with a stony silence!

Undoubtedly the Fleet Air Arm, amongst the Services, made the best and most thorough use of amateurs from the very start.

Maybe it was that the Admiralty had no hide-bound ideas about initial training; maybe they realised that there was all the difference in the world between operational and non-operational requirements in a pilot; or maybe they were just short of flying personnel, and saw in the amateur a useful source of supply which was far from being fully tapped.

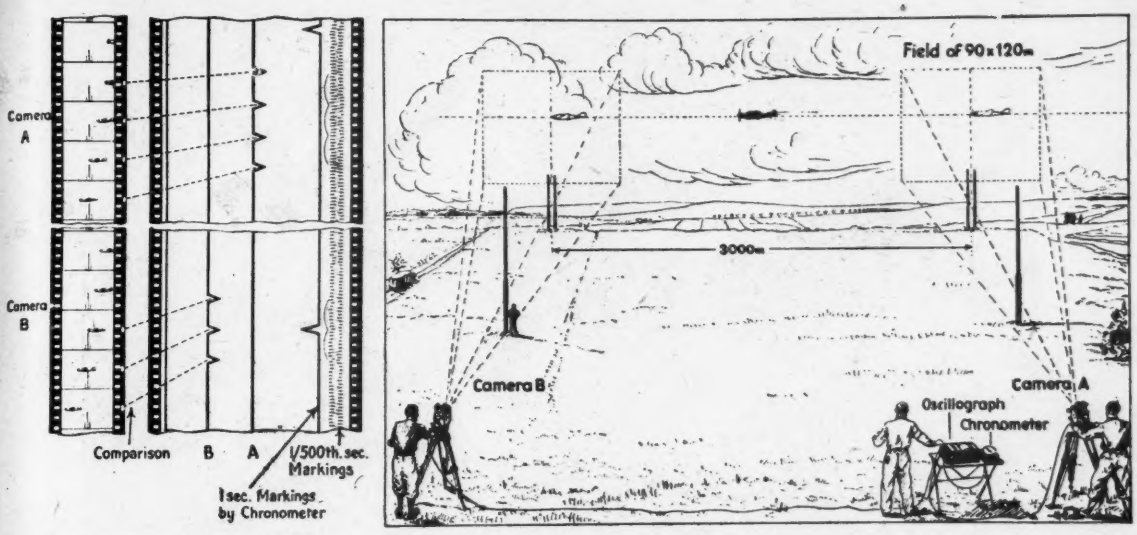
The F.A.A. and A.T.A. ran, so to speak, neck and neck during the early months of the war in their search for "talent." No doubt they collected a small proportion of "duds," but the vast majority of amateurs proved thoroughly capable of doing the work required of them, and, furthermore, were often old enough and experienced enough to be given responsible posts and consequent medium-high ranks. By contrast, non-operational pilots in the R.A.F. could never aspire to a rank higher than that obtained by seniority.

Record of Service

One day, perhaps, the Air Ministry might compile a record of the flying work done by "A" licence holders in the different Services and in different organisations. In my own circle of acquaintances alone I can count dozens and even hundreds of genuine amateurs, airborne in peacetime solely by virtue of a subsidy, who have done good work in the air, and there are undoubtedly many hundreds more.

It might even be worth the while of some ambitious Member of Parliament to collect the statistical information from various sources, so that, when the question of club subsidies crops up again, he will be able to give the necessary facts and to show that, far from being wasted, the peacetime subsidies paid ample dividends. Certainly, I feel that the facts ought to be better known both to the taxpayer and to those who have the power to spend the taxes.

"INDICATOR."



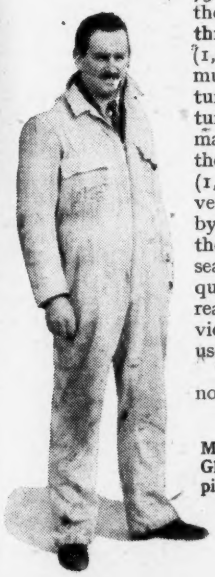
HOW THE GERMAN RECORD WAS TIMED : The distance between the posts is not to scale in the diagram. On the left are the film and oscillograph strips.

The World's Speed Record

Gloster Meteors Ready for the Attempt : Target is 600 m.p.h.

THERE is quite a possibility that shortly after this week's issue reaches our readers the world's speed record may have been beaten by more than 100 m.p.h. The two Gloster Meteor jet-propelled monoplanes with Rolls-Royce power units are awaiting suitable weather conditions, and two pilots, Mr. Eric Greenwood and Group Captain H. J. Wilson, are standing by, ready to make the attempt. The necessary timing machinery is in place on the course off Herne Bay in the mouth of the Thames, with the actual speed course marked by buoys and balloons.

F.A.I. regulations stipulate that the timing posts must be 3 km. (1.8641 miles) apart, and that the machine must not, while traversing the course, exceed a height of 75 metres (246ft.). Before entering the course the machine must pass through an approach 500 metres (1,640ft.) long, in which also the height must not exceed 75 metres. While turning at each end the pilot may turn as wide as he likes, but the machine must not at any time during the turn exceed a height of 400 metres (1,312ft.). This, of course, is to prevent fictitious speeds being built up by diving on to the course. But even the slight dive from 1,312ft. to near sea level in the approach can add quite a few miles to the speed of a really "clean" aircraft, and in previous attempts pilots have made full use of this fact.



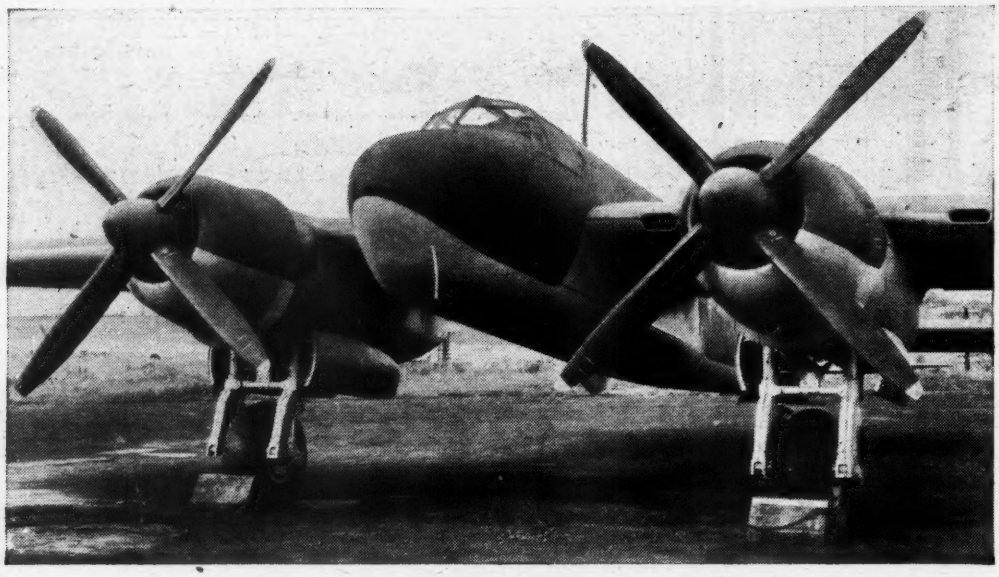
Mr. Eric Greenwood, Gloster's chief test pilot who, with Grp. Capt. Wilson, is standing by, ready to make the attempt.

The Gloster Meteors will certainly not need to dive in order to beat the existing record. They could do that on half throttle with the pilots standing up and waving their bowler hats, so to speak! The only question is by how much they will exceed it. No performance figures for the Meteor have yet been published, but from the fact that its wing span is 43ft. one can deduce that it is by no means a small aircraft. The armament carried by the standard Meteor fighter is such that, coupled with the weight of the fuel that has to be carried to give it a reasonable duration, the loaded weight of the Service version is probably not far short of six tons. If that assumption be correct, the Meteor will be by far the heaviest aircraft which has ever attacked the world's speed record. It will also be the first to do so with paraffin as the fuel. Previous records with piston engines have used very special doped fuels.

Mr. W. G. Carter, Gloster's chief designer, who designed the Meteor.

So rapid is the rate of development in the jet-propulsion field that the thrust obtained from a unit increases almost from day to day. One may be sure, however, that for the record attempt Rolls-Royce have produced something rather exceptional. Taking everything into consideration, we imagine that 600 m.p.h. is likely to be achieved or even exceeded by the Meteors.

In view of the very high speeds which will undoubtedly be achieved, the previous world's record does not matter a great deal, but it may be of interest to recall briefly that two were reported to have been established in March and April, 1939. First there was Dieterle on a Heinkel monoplane with Daimler-Benz engine whose average speed over the measured course was 746.66 km./hr. (463.953 m.p.h.). A few weeks later this speed was beaten by Fritz Wendel on a Messerschmitt. He averaged 755.138 km./h. (469.2 m.p.h.).



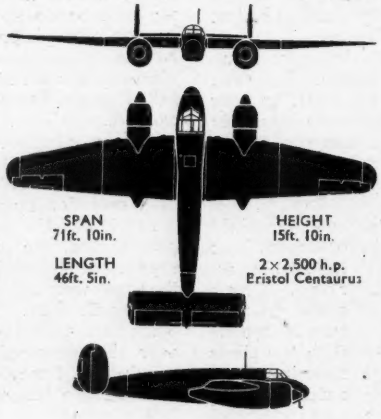
The Bristol Buckmaster

First High-powered Twin-engined Advanced Trainer in the World : Five Thousand H.P., 33,700lb. Gross Weight

A TRAINER with 5,000 h.p. available from its two engines, and with a speed of more than 350 m.p.h., sounds at first somewhat fantastic. Yet that is the basis of the Bristol Buckmaster, a picture of which we published recently. The machine is, it goes without saying, an advanced trainer, and the reason for its existence is that it was found during the war that lives and aircraft were lost because of the large gap between the standard elementary trainers and the operational types of aircraft. In the case of the Beaufighter, for example, the instructor has had to stand behind the pupil, a position which gave him little opportunity to correct mistakes in an emergency. In preparation for newer and even more powerful operational types (Beaufighter replacements, for instance), it became necessary to have an advanced trainer with the flying and handling characteristics of the replacement aircraft, and the Buckmaster is the result.

With its two Bristol Centaurus engines, each developing more than 2,500 h.p., the Buckmaster has a top speed of 352 m.p.h. at 12,000ft., a maximum weak-mixture cruising speed of 325 m.p.h. at 18,000ft., an initial rate of climb of 2,245 ft./min., and a service ceiling of 30,000ft. These figures give some idea of degree to which this trainer simulates the characteristics of operational types of aircraft. Its size is also such as to represent adequately any high-performance machine, and even the gap between it and the "heavies" is relatively smaller than that which existed between the original trainers and the contemporary operational types. With a span of 71ft. 10in., a length of 46ft. 5in., and a height over the rudder of 17ft. 5in., the all-up weight is 33,700lb.

In its general design, the Buckmaster is a mid-wing all-metal monoplane of quite orthodox layout. The Centaurus engines are fitted with Townend rings to reduce drag, and an interesting fact is that cooling is assisted by a fan behind the airscrew spinner, the degree of cooling being, of course, controlled in the usual way by electrically operated gills at the rear end of the cowling. The engines drive four-bladed Rotol airscrews.



Dual Controls

The Buckmaster is equipped for training purposes as a three-seater. The cockpit, forward of the wings, has the pupil's seat on the port side, the instructor's to starboard. The latter has, in addition to the flying controls, a dual set of controls for the operation of undercarriage, flaps, brakes, airscrew speeds and feathering, and engine throttles. The flying controls are of the Saunders type, with tubes operating in push-pull and torsion. The wireless operator's station is between the wing-root spars, his equipment being grouped mainly on the port side of the fuselage. Other equipment includes blind-flying instruments, sea markers, G.45 camera gun, signal pistol and cartridges, signalling lamp and dinghy.

With a view to making the Buckmaster suitable for, among other things, navigational training, a very ample fuel tankage giving long range has been provided with a total of six tanks, two in each inner and one in each outer wing. A cross-feed pipe enables fuel to be supplied to either engine from any pre-selected tank. An electrically driven booster (pulsometer) pressure pump is fitted on the underside of each tank and ensures the supply to the carburettor via the engine-driven pumps The tanks are of the non-metallic, self-sealing type.

The undercarriage is of the Dowty levered suspension type, with Dunlop wheels, brakes and tyres. The tail wheel, also of the levered suspension type, has a self-centring device to ensure that it lies fore and aft when

being retracted. The wheels are normally operated hydraulically, but there is an emergency cartridge firing installation for lowering the wheels should the main system fail.

Structurally, the Buckmaster is of straightforward stressed-skin construction, the fuselage being a semi-monocoque with channel-section frames and angle-section stringers. The wing is of two-spar construction, and comprises wing root integral with the fuselage, inner wings and outer wings. Metal-covered Frise ailerons are fitted, both provided with balance tabs. There are six hydraulically operated split flaps, one on each outer and two on each inner wing. Elevators and rudders are fabric covered and are fitted with trim tabs. They also have a spring mechanism which automatically brings the trim tabs into operation as servo tabs when the load on the control column or rudder bar exceeds a predetermined figure.

In the Air II

Twin Trainers

The Second of a Series of Impressions of the Handling Characteristics of Well-known Types

By INDICATOR

ALTHOUGH the Anson can hardly be considered as a training type, it has so been used, officially or unofficially, to quite a considerable extent, and provides some interesting comparisons with the true intermediate twin trainer, the Oxford.

Some unkind humorist once remarked that "the Hudson makes a good conversion trainer for the Oxford," and certainly the latter is not an easy aircraft when on and near the ground unless the pilot is happy merely to keep it vaguely in one piece. Therein lies its major strength as a training type; it must be handled quite firmly for the best results and does not entirely forgive any really outstanding errors while landing and taking off. To the reasonably experienced pilot it offers no problems, but even he may find himself in temporary difficulties if he treats it just too casually once too often. Not that he is liable to do any damage—merely that the performance will look very untidy and that he is likely to emerge with a distinctly red face while making some weak excuse about a sticking brake-catch.

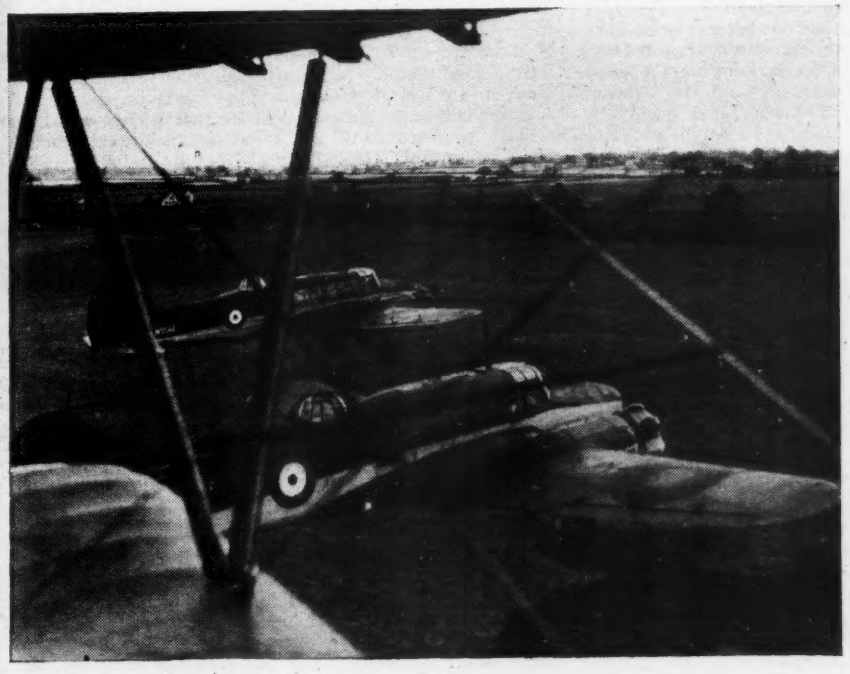
For, delightful though it is on a cross-country, the Oxford has, when on the ground, a little way of darting from the straight and narrow unless it is handled firmly when showing any such signs of restiveness. It is all, I think, a matter of ground angle, c.g. position, and a really honest stall (so useful for demonstration!); there are no after-effects for anyone who learns to use his throttles properly during the take-off and who is ready to use his thumb on the brake lever at the moment when the tail-wheel touches—whether during a three-point, or at the conclusion of the wheelers which seem, sadly enough, to be taught at A.F.U.s.

Planned Controls

The pupil who is Oxford-conscious should be able to climb into any other aircraft and put up some sort of show. Yet, curiously enough, the man who "lives" on the type will never, never agree that it offers any difficulties at all.

Remembering that the Oxford was designed and put into production long before the war, the control layout is something to be admired in a world where so many multi-engined aircraft (and others) appear to have no layout plan at all. Everything is arranged around the central control pedestal, and the pupil learns early to deal with two throttles in his right hand—no easy business for the novice who has been dragged past the *ab initio* stage with his right hand in complete charge of his own control reflexes. In the flying of aircraft, so often one's right hand does not know what one's left hand is doing.

By contrast, the Old Lady of Woodford might have proved to be altogether too easy for the pupil—though even the Anson has been known to proceed in a violent semi-circle when the throttles have been hamly opened. It was designed, too, in the days before hydraulics and electrics could be properly laid on, and a series of normal



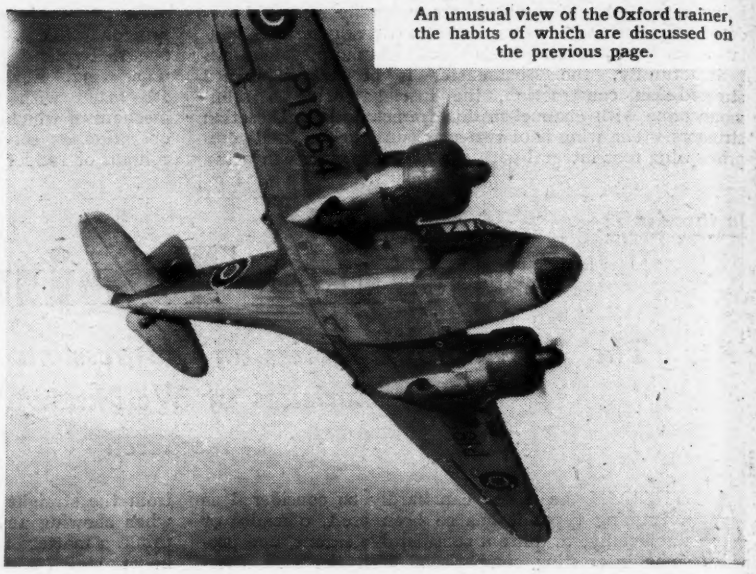
It is amusing to recall that in 1940, when this photograph was taken, the censor would not pass it. In those days the Anson was operational and aerial photographs, from however low a level, were strictly taboo.

TWIN TRAINERS

circuits and bumps would have provided more than adequate daily exercise in pumping and winding for both the pupil and the instructor. As a ferry and odd-job aircraft, the Anson has been superb. It jogs along at no mean speed—about 140 m.p.h.—and has carried quite illegal loads without showing signs of aerodynamic trickery. Once on the move it is easy to take off, and is absurdly easy to land, though the new-type cowlings have recently made the elevator control a little less effective than it was, so that more accidental wheelers are now to be seen.

It is to be supposed that the Anson has some vice in its make-up, but, unless one includes a possibly temperamental fuel system if this is incorrectly handled, it is difficult to find. I know one case where it was flown on one engine with a full load for more than half an hour, during which time it reached some quite phenomenal height and of another case where, in bad weather and with a failing fuel supply, it was brought in at tree-top height on one engine and with the undercarriage down.

At least once I have been aboard with as many as thirteen other guinea pigs and their parachutes during the 1940 days; admittedly it ground-looped on landing, but then it just wasn't possible to keep such a load within proper c.g. limits!



An unusual view of the Oxford trainer, the habits of which are discussed on the previous page.

Remarks on the Beaufighter appeared in the September 20th issue.

Tracing Missing Airmen

Missing Research and Enquiry Service : Following Slender Clues

By MAJOR F. A. de V. ROBERTSON, V.D.

ONE of the biggest jobs on which the Royal Air Force is now engaged is the effort to trace missing airmen. Since the beginning of the war in Europe there have been some 30,000 cases of officers and airmen missing from operations. So an R.A.F. and Dominions Missing Research and Enquiry Service was set up. It has been at work since 1941, but its activities increased enormously after D-Day. Naturally, further opportunities for enquiry were opened up after the Allies occupied Germany and the fighting ceased. After the liberation of Europe had begun, it became possible to establish Missing Research and Enquiry Sections on the Continent. At first they operated in France; later their activities were extended to Belgium and Holland. The service has now commenced to make enquiries in Norway and Denmark, and also in Germany itself. There is also a section in Italy, which intends to extend its activities to the Balkans as soon as it is possible. The service is busy with cases dating from the beginning to the end of the war. Problems dating from May, 1940, are still being solved.

As everyone knows, there is no form of loss which causes more acute distress than a report that a near relative is missing. One remembers the great work done by the War Graves Commission at the end of the first world war, and what consolation thousands of bereaved relatives have found from visiting the graves where the body of the lost man is lying. The time has not yet come for dealing with the bodies of our dead Britons who gave their lives in the recent war in this way. No doubt the work will be undertaken in time; but for the present much sorrow and anxiety can be relieved if definite information can be found about where and when a missing man fell and where his body has been buried. So the Missing Research and Enquiry Service spares no pains in its efforts to trace out each case, and enquiries are pursued sometimes for two years or more.

The methods followed by the service are like those of a detective agency. In the first place it is necessary for the enquiry parties on the spot to have a fluent knowledge of the local vernacular. Mere schoolboy French is not good enough. There are many languages in the parts of Europe to be covered, and men with intimate knowledge of some of them are not easy to find. The enquirers need also to have a good deal of the acumen and general mental equipment of a Sherlock Holmes. They must be able to distinguish between a promising and a useless clue, and have a flair for recognising and rejecting misleading (though often well-meant) stories by local peasants and others. The oddest scraps of clues may sometimes lead to identification. Experience helps the parties to grow expert at their work; while the organisation in London fits all the little bits of information together, and arrives at its own conclusions.

A Stirling Crew

On one occasion the service was trying to find out the fate of the seven members of the crew of a Stirling which had not returned from a raid in the spring of 1943. It was known that in a Belgian village 20 miles from Louvain there were three graves, two marked with the names of sergeants, while the third was marked "Three Unknowns." It was also rumoured that two had baled out. The enquiry party arrived at the village on a Sunday afternoon when few people were about. The enquirers could speak French well, but not Flemish, which was the local vernacular. The graves were not found in the churchyard. Then two cyclists, a brother and sister, who could talk some French, told the party of another graveyard. The girl said that she knew the name of one of the missing men. She and her brother had also picked up a shirt cuff with a gold link in it and a piece of shirt collar with a name on it. She took the party to the cemetery and

TRACING MISSING AIRMEN

showed them the graves. She said that all the aircrew had perished in the explosion, and it was not true that any had escaped by parachute. The girl then took the party to her mother's cottage, and the latter produced from a secret recess the gold sleeve-link. Her sister had the shirt collar with the name on it. This was also displayed, and proved to be a piece of an officer's shirt, with a laundry mark, an outfitter's label, and a woven name (the same which the girl had mentioned). The scrap of cuff (which was tiny and had not been kept) was stated to be of the same material. There had only been one officer in the crew of that Stirling, and so the chain of evidence was complete.

Overlap of Services

A puzzling case was that of a fighter which had been shot down over Calais in 1940. The only useful clue was the name of an English county. The Casualty Branch of the Air Ministry ascertained that no one with a home address in that county had been lost on that date. The Missing Research Service then applied to the Chief Constable of the county. He did splendid work and took no end of trouble. As a result of his enquiries it turned out that the fighter in question had belonged to the Fleet Air Arm, which explains why the Air Ministry had no knowledge of it.

Another curious case concerned a Typhoon. The enquiry partly recovered its cannon, and noted the numbers on them. But, as it afterwards turned out that these cannon had been taken off another crashed Typhoon and installed in the machine in question, these numbers hampered rather than helped the enquiry. A scrap of coloured scarf worn by the pilot was also found, and a firm of tailors identified it as being the Old Boys' colours of a certain school. The date of the casualty was known, and so an enquiry from the headmaster of the school ultimately identified the pilot.

Once an unknown body of an airman was discovered near the Pyrenees. That caused the Service a lot of thinking. They first imagined (and this shows how ingenious they have become) that the man must have belonged to a formation which was once flying back from Italy but encountered a gale and made off to the south-west to avoid it. But it was impossible to link the case with any known casualty in that area. The mystery was not solved for a long time, but at last a tragic story came to light. This airman had baled out over northern France, and the *Maquis* found him and tried to get him away. They smuggled him down nearly to the frontier of Spain; but there the Germans caught him and shot him as he was crossing into safety. From the point of view of the Service, the moral of the story is that even the strangest case may be explained in time if only the Service never gives up hope. That case was kept open for two years.

The numbers on Service watches often give a clue to the identity of the wearer, and so do rings at times. But sometimes rings have monograms inscribed on them, and it is difficult to guess which is the right order of three letters. Puzzling but not hopeless clues are such things as a cigarette case with an inscription such as "To Dick from Vera." They are pathetic, but do not help much towards identification.

One Mother Superior of a hospital in France kept careful records of all cases which went through her hands—at her own peril, she said. But, as many of the names were misspelt, it was some little time before her record was of much use to the Missing Service. They eventually proved very useful, not only to the R.A.F. but also to the British and American Armies.

Laundry marks have often proved helpful, and two trade journals circulate the enquiries—good work, for which they deserve credit. Corroboration by more than one clue often leads to a definite conclusion.

When a case has been completed and the knowledge of what has happened to the missing man or men is complete, a personal letter is written to the next of kin, in which official jargon is studiously avoided. These letters are much appreciated, and numbers of cordial acknowledgments have been received by Missing Research.

MORE AWARDS FOR BURTON RESCUERS

TWO more awards have been announced by the Air Ministry to heroes of the Burton-onTrent underground bomb-dump disaster last November, when 70 people were killed in an explosion which rocked the surrounding district and caused widespread devastation.

The latest awards (several to Servicemen and civilians were announced last April) go to two R.A.F. officers who rushed back from leave to the scene of the tragedy.

They are Group Capt. Ronald Charles Storrar, of Egginton (Derbyshire), commander of No. 21 Maintenance Unit, R.A.F., who gets the O.B.E.; and F/O. Joseph Wilfred Solomon, of Sutton Coldfield (Warwickshire), the officer normally in charge of the mine area, who wins an M.B.E.

Group Capt. Storrar, says the citation, supervised the removal from the danger area of bombs and explosives, some of which were still liable to detonate, and remained in the mine until the work was complete.

F/O. Solomon led parties in search of missing workers and, with a squad of volunteers, cleared underground rail tracks to facilitate the clearance of the mine.

"These two officers," the citation adds, "accepted considerable personal risks in order to remove the danger which threatened the neighbouring towns and villages."

MAJOR T. M. BARLOW'S RESIGNATION

AFTER being with the Fairey Aviation Co. for more than 21 years, Major T. M. Barlow, who joined the firm as chief engineer in August, 1924, and was appointed a director when the public company was formed, has had to retire on account of ill-health. He will, however, continue to serve in a consultative capacity.

Major Barlow was educated at Wrekin College and Birmingham University, and, after being apprenticed to Siemens, Stafford, became their assistant engineer. In 1915 he joined the R.N.A.S. and qualified as a non-operational pilot, being about 30 years of age at this time. From 1918 to 1924 he was chief technical officer at the R.A.F. Experimental Establishment, Martlesham Heath, and after joining Fairey's was a key man in the development of such well-known aircraft as the Fairey III.F., Swordfish, Battle and Fulmar.

During the 1935-43 period Major Barlow was a director and general manager of the company's N.W. area factories, and for three years was president of the Stockport Chamber of Commerce. He is also a past vice-president of the R.Ae.S.

Another change at Fairey's is the election to the board of Mr. Richard Fairey (son of Sir Richard Fairey, the chairman and managing director), who, after serving as a pilot in the A.T.A., and afterwards at the R.A.F. Experimental Establishment at Boscombe Down, returned to the company and was lately appointed manager of the Weybridge factory.

WAR PICTURES AT THE ACADEMY

ALTHOUGH there are just over 1,000 pictures at the exhibition of national war pictures being shown to the public at the Royal Academy, these cannot truly be said fully to represent the efforts of British war artists as a whole since their combined output exceeds 5,000 works.

Most visitors to the Academy will no doubt feel that the present collection is big enough, even though the restriction has meant that certain artists and some phases of the war are not at present represented. It is, however, the biggest collection of war pictures ever shown under the aegis of the War Artists' Advisory Committee on behalf of the Ministry of Information, and the omissions will be made good to some extent by exchanging, later on, some of the works by artists who are well represented for those of others not now included.

Some of the pictures dealing with the war in the air have previously been seen at the National Gallery, but the visitor whose chief interest is in the R.A.F. will find much that is new. What he thinks of them will, of course, depend on whether he is a "student of art" or one of those simple souls (like the writer) who prefers that pictured aircraft should at least look capable of flying. Roy Nockolds and Terence Cuneo, who really do know what an aircraft looks like, are not represented at all, and even Frank Wootton has only one picture there. Fortunately, however, the brilliant portraits of Eric Kennington do much to compensate for the "artistic" crudities of a number of other very famous painters!

Spring Tabs*

Some Lessons Learned by Consolidated Vultee Since Their First Application of Boost Tabs Early in 1942

By FRANK W. DAVIS

WITH the advent of the present trend toward aircraft of larger dimensions and weight, higher powers, and higher speeds, the problem of obtaining satisfactory controllability by direct manual operation of the controls has become tremendously more difficult.

It can be shown that for geometrically similar aircraft the control force varies as the cube of the physical dimensions and as the square of the velocity, assuming the same angle of attack and control-surface deflection. That is, if the size of an aircraft were doubled the rudder force required to produce a given angle of yaw, the elevator force required to produce a given acceleration, or the aileron force required to produce a given helix angle at the wing tip would be increased by eight times.

If the speed were then doubled, the aileron force and rudder force would be multiplied by an additional factor of 4, making a total increase of 32 times that of the original machine. The elevator force gradient in pounds per "g" would theoretically remain unchanged by the speed change. If the same rate of roll were desired rather than the same helix angle, another factor of approximately 2 would be introduced and the aileron force required would be 64 times larger than for the aircraft of half the speed and size.

For a 500 m.p.h. aircraft of approximately twice the span of most present-day fighters, approximately 98 per cent. of the hinge moment of a plain aileron would have to be balanced-out in order to meet present fighter requirements.

The consequences of this trend are well exemplified by the history of one of the earlier dive-bombers. Attempts to secure satisfactory stability and control characteristics by use of simple aerodynamic balance and geared tabs consumed 98 hours of flight testing, involving 119 modifications, and the results were even then not entirely satisfactory. Such a process is highly educational but is so uneconomical of time and money that some better method of obtaining satisfactory control characteristics appears to be mandatory if aircraft are to be developed at reasonable cost and reasonably quickly.

It can also be seen that an aircraft requiring 95 to 100 per cent. of perfect balance on control surfaces will be subject to wide variations in handling characteristics because of production tolerances. This situation was found to exist in the production dive-bomber mentioned previously. For example, an elevator control force gradient of 12 lb. per "g" was desired. The prototype actually ran about 15 lb. per "g," but some of the production models ran as high as 25 lb. per "g."

This situation points out the necessity of a device which, in addition to providing quick adjustment of control forces during the prototype development, will be insensitive to normal production tolerances. The necessity for low maintenance, light weight, and simplicity are ever present in aircraft design and need not be expanded here.

Principle of Operation of Spring Boost Tab

Calculations and flight tests indicate that the spring tab provides a satisfactory solution to the above problems.

A spring tab may be defined as a control-surface tab whose deflection is primarily a function of the hinge moment occurring at the control surface. Its direction of movement is at all times such as to decrease the absolute value of the control-surface hinge moment. Contrary to conventional geared boost tab the movement of the spring tab is independent of the control-surface deflection, except in so far as such deflections cause changes in stick force. The diagram may help to illustrate the principle.

Whenever a force is applied at the stick or wheel, it is resisted by the hinge moment of the control surface. This resistance causes the control horn to rotate with respect to the surface and deflect the torsion spring. The relative motion of the horn with respect to the surface is translated into angular motion of the tab. It can be seen, then, that the motion of the tab is always in a direction tending to help the pilot, and the help it provides is proportional to the force the pilot applies

Aerodynamic Design

The actual aerodynamic design of a spring tab is strongly influenced by several practical considerations. First, "feel" on the ground and in the air is improved by a stiff spring of small deflection. Approximately 5 deg. of wind-up appears to be the maximum practical limit. Secondly, in installations such as that shown in the diagram the maximum length of arm which can be housed in the surface and the minimum length of tab actuating horn determine a maximum boost ratio which can be used. This is of the order of three to one, giving a maximum tab deflection of approximately 15 deg., which is also about the limit of good aerodynamic effectiveness. Thirdly, the tab should be as small as possible in order to reduce weight and to make easier the problem of preventing flutter. The use of a reasonable amount of aerodynamic balance on the surface will make this possible. Other practical considerations are primarily those of preventing flutter.

Theoretical methods for determining tab chord, span, deflection, and spring constant have recently been published in certain N.A.C.A. reports. These methods are similar to those used by Consolidated Vultee and can be used in conjunction with the above practical considerations to arrive at a tab design which will give the desired results.

Flutter

A study of early application of spring tabs reveals that flutter was encountered in most cases. Further examination shows, however, that mass balance was not generally applied. Calculations indicate that flutter can be avoided by proper design and use of mass balance.

The procedure used in flutter analysis of spring tab systems is essentially identical with that followed in all flutter analyses. Briefly, it consists of:

(a) Writing the differential equations of motion of the aircraft components between which inertia, elastic, and aerodynamic interaction can take place when a small disturbance from equilibrium is given to one or more of these components, and

(b) Solving these equations of motion for a given set of conditions corresponding to a particular airspeed to determine the degree of stability or instability existing against flutter. This process, repeated for a sufficient number of airspeeds, leads to a plot of the flutter-stability versus airspeed covering the entire speed range of the aircraft.

The results of calculations are considered in the light of the degree of applicability of the assumptions made regarding the particular case in question. In fact, it is a good practice to investigate the results of varying a number of the important parameters entering the calculation over a

* Paper read before the National Meeting of the Institute of the Aeronautical Sciences.

range of values conforming to the probable accuracy of the assumptions and the data entering the calculations.

General Rules

Experiences with spring tab flutter calculations indicate that several general rules can be stated in regard to preventing this type of flutter; these are:—

(a) The reduction of the tab size to an absolute minimum consistent with control requirements. In this regard, use of the spring tab to do the complete job of balancing the main control surface hinge moment is not recommended as it leads to an unnecessarily large tab from the flutter standpoint.

(b) The achievement of a minimum of play and flexibility in the operating control system and supporting structure, including main control surface ribs.

(c) The use of as high a tab spring constant as possible.

(d) The attainment of proper static and dynamic balance with the smallest possible tab moment of inertia. This is especially important as theoretical results indicate that the indiscriminate addition of balance weight to tab to achieve static balance without due regard to the effects of this balance weight in increasing the tab moment of inertia can actually result in lowered flutter speeds. Thus. external balance arms which do not lie in the plane of the tab are to be avoided as the moment of inertia of the tab is increased disproportionately to the degree of static balance achieved.

(e) In certain applications the gear ratio of the tab, i.e., the ratio of the tab deflection to the spring deflection, in a system such as shown in the diagram, will define a certain maximum distance forward of the tab hinge line at which the tab balance weight can be located. More forward locations will be detrimental from the flutter standpoint. From this point of view, small gear ratios are beneficial.

(f) Finally, unless previous experience in the use of such tabs is available, a thorough flutter analysis should be conducted in all new applications in order to assure safety and maximum efficiency of design.

Curing Flutter

One case of flutter was encountered during routine production testing of the dive bomber previously mentioned. The flutter appeared to occur in the tab-elevator system only and was non-destructive. The tab involved was examined and was found to be improperly mass-balanced. The balance was corrected, but flutter occurred again, only at 423 m.p.h. instead of 378 m.p.h. as in the first case.

From the characteristics of the flutter, it was suspected that some aerodynamic flow instability occurring at the tab was coupling with the spring deflection at the proper frequency to produce the flutter. The tab was found to be slightly convex in section. This was changed to a slight concavity and the same tab was reinstalled. No flutter occurred with this condition up to the limit dive speed of the aircraft. No flutter has occurred on any subsequent installations.

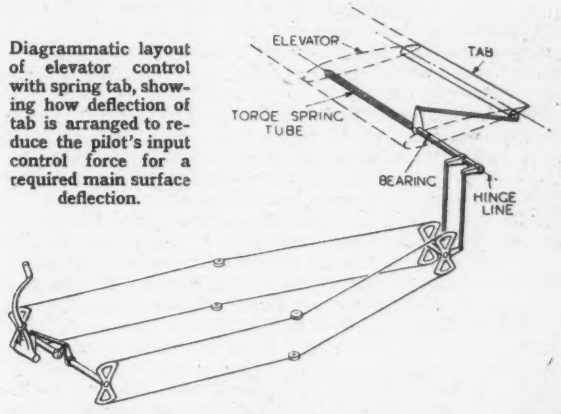
The total cost in weight of the spring tab on an aircraft of approximately 20,000 lb. is 14.0 lb. for the elevator, 8.00 lb. for the rudder, and 14.0 lb. for the ailerons. It is felt that this compares favourably with other means of accomplishing the same end.

Application to Recent Designs

The application of spring tabs proves to be extremely simple mechanically. The schematic diagram shown is the system which has actually been successfully applied to several types. No special maintenance has been necessary.

In order to illustrate the benefits which can be realised by use of the spring tabs, the flight test histories of three aircraft will be used. The first was a single-engine dive bomber of approximately 13,000 lb. The discouraging attempts to obtain satisfactory handling characteristics by use of aerodynamic balance and simple boost tabs have already been mentioned.

It is agreed by most authorities that a large dive bomber poses very serious requirements for stability and control. The reason lies not alone in size, but in the fact that the magnitude and rapidity of speed changes are large, centre of gravity travel is large, and the use of dive brakes, bomb doors, and other such equipment may seriously alter trim, control or stability. Coupled with this situation is the absolute necessity for light, sensitive, but well-damped control during dives in order to obtain accuracy, and the requirement that the resetting of trim tabs should not be necessary during a dive.



Diagrammatic layout of elevator control with spring tab, showing how deflection of tab is arranged to reduce the pilot's input control force for a required main surface deflection.

The spring tab was first applied to the rudder. The rudder was chosen because the problem of directional trim change during the dive was serious, and also because it was known that the consequences of rudder failure, if flutter occurred, would probably not mean the loss of the aircraft. A device for locking-out the spring tab was also provided.

Effective Throughout Speed Range

The results of the first flight with this arrangement were extremely encouraging. The whole speed range of the aircraft was covered without any sign of flutter, and rudder force remained light up to the limit diving speed. It was possible to trim at speed for best climb with full power and then dive to terminal velocity with dive brakes open without any change in trim which could not be easily handled without the use of the trim tab. After that, the mechanism was redesigned for lightness and simplicity and the spring constant adjusted to provide further refinement of forces.

The application to the elevator was then made with equally encouraging results. It was possible to obtain the desired stick force of 12 per "g" and to hold it within approximately ±1 lb. per "g" on subsequent production models. The theoretical calculation had shown that the force gradient in pounds per "g" would decrease as speed increased. This was found to be not true. The force gradient remained practically independent of speed from 200 to 400 m.p.h. This fortunate phenomenon occurred because the fabric-covered elevators were vented in such a way that the deformation at high speeds caused an increase in hinge moment which just balanced the decrease due to the spring tab. It has been possible to arrive at the same situation on subsequent applications.

The second application of spring tabs was on an unconventionally arranged fighter weighing about 19,000 lb. Satisfactory characteristics were obtained on the rudder and elevator after 8 hours and 12 configuration changes. Aileron characteristics were extremely poor without spring tabs. By use of spring tabs, their characteristics were greatly improved but not to the extent desired.

The most recent application of spring tabs at Consolidated Vultee was on a single-engine attack bomber of approximately 20,000 lb. It was desired to meet fighter requirements on handling characteristics through a C.G. travel of 10 per cent. Fighter characteristics were achieved on

SPRING TABS

longitudinal and directional control after 14 hours of flight testing, involving 16 configuration changes, all of minor nature. Elevator control force was 7 lb. per "g" at maximum rearward C.G. and 11 lb. per "g" at maximum forward C.G., a phenomenally small change in gradient with change in C.G. position. The result of the application to the ailerons was similar to that just related on the fighter.

In both instances where spring tabs were applied to ailerons considerable improvement was obtained, but in neither case did ideal characteristics result. However, in both cases aileron characteristics were very bad without the spring tabs and the tabs were added as a last resort. In general, the aileron forces were markedly lightened at high speeds, but not much affected at low speeds. It is felt that had satisfactory low-speed characteristics existed on the ailerons to which the tabs were applied, the desired overall characteristics might have been obtained.

One difficulty in the application of spring tabs to ailerons is that the ailerons are tied together so that the up-floating tendency of each aileron is balanced against the other. When springs are introduced at the ailerons in a manner similar to the elevator as shown on the diagram, each aileron is allowed to float up against the spring. At high speeds and high angles of attack, the spring is deflected against its stop, thus limiting the tab action to one direction only. Although the up-floating ailerons undoubtedly increase the drag to some extent flight tests have failed to reveal any appreciable loss in speed when stiff springs are used. There is one advantage in that wing loads at high angle of attack are somewhat relieved by the up-floating ailerons.

A rather interesting application of the spring tab to elevator free static longitudinal stability has also been made. The tab was rigged to ride up approximately 7 deg. with no load on the spring. With this rigging, the tab tends to trail at some slight up-angle at any given airspeed. If the airspeed is decreased, the tab tends to trail higher, thus forcing the elevator down, tending to return the aircraft to the original trim speed. If the airspeed is increased, the tab trails at a lower angle, forcing the elevator up, thereby tending to return the aircraft to its original trim speed. An increase in stick-free static longitudinal stability of approximately 6 per cent. was actually obtained by this method.

This idea will work only if friction in the tab system and in the control system is very low. As a matter of fact, low friction is absolutely essential to the successful application of spring tabs as outlined in this paper. It is conceivable that by using preloaded springs, considerable friction could be tolerated. However, in any case, friction should be kept as low as possible.

Conclusions

In conclusion, a few rules will be stated which should be followed by anyone interested in using spring tabs.

1. Design to prevent flutter.

(a) Keep the moment of inertia of the tab about the hinge line as low as possible.

(b) Provide a small amount of excess mass balance to take care of dirt or ice accumulating on the tab.

(c) Keep spring constants high.

(d) Keep all supporting and actuating structure stiff and free from play.

2. Keep friction in the entire control system to an absolute minimum.

3. Use the spring tab only to obtain refinement in characteristics, not as a cure-all for a basically poor control surface.

4. Keep it simple.

P.o.W. AIR LIFT THROUGH MONSOON

BATTLING against the worst monsoon weather, aircraft of the R.A.F. Transport Group in South East Asia in one week recently evacuated 2,215 Allied prisoners of war.

So bad was the weather that 60 sorties could not be completed. But, in spite of this, 1,792 P.o.W. were evacuated from Siam to Mingladon, near Rangoon, and 423 more arrived there by air from French Indo-China.

On the outward journey the aircraft carried considerable quantities of stores to Bangkok and Saigon, including rations, petrol, medical and canteen supplies, equipment and bitumen.

Eight hundred people were also flown in to Siam and Indo-China.

NEW MALCOLM CLUB NEAR BERLIN

HOBBY rooms, including a fully equipped dark-room where Servicemen can develop and print their own films, are among the attractions of the new Malcolm Club at Gatow Airfield, on the outskirts of Berlin.

The club, which caters for the entertainment of "other ranks," is situated in the former *Luftwaffe* Officers' Clubhouse, and it has three comfortable lounges, two writing rooms, two games rooms, and a skittle alley.

A contingent of W.A.A.F. personnel is expected in the Berlin area any moment, and arrangements are already going ahead for dances, concerts, bridge and whist drives.

German civilians have been recruited to wait on the airmen and airwomen, and a German light orchestra entertains in the canteen. Soon it is hoped to add an exchange library and a souvenir shop.

This is the twelfth Malcolm Club to be opened, and three more are planned in the British Zone in the near future. All are named after the late Wing Commander Hugh Malcolm, first R.A.F. V.C. who lost his life on a "suicide mission" in the North African campaign from which none of our crews returned.

HESS RETURNS TO GERMANY

RUDOLPH HESS left Madley Airfield, near Abergavenny, for Frankfort at 8.50 a.m. on Monday, October 8th, in a Dominie aircraft on his way to stand his trial at Nuremberg.

He was driven to the airfield in a closed Army car with drawn blinds. Hess was black-jowled, unshaven and impassive, and wore grey civilian clothes and a grey slouch hat. He looked ill and thinner than in his most recent photographs.

He was accompanied by one Army guard, a medical officer and attendant, and an official of the War Crimes Commission.

DUKE OF GLOUCESTER GREETS P.o.W.

WHEN 30 men of 605 County of Warwick Auxiliary Squadron arrived recently at Sydney en route for England from Japan, where they had been prisoners of war, they were greeted by H.R.H. the Duke of Gloucester, Governor-General of Australia.

All the men looked fit and well, and when they reach the United Kingdom arrangements will be made to hold a squadron reunion in their honour.

News of the Duke's gesture towards the men reached London in a special cable from Brigadier Schreiber, the Chief of Staff to His Royal Highness.

It was addressed to Air Commodore Lord Willoughby de Broke, Director of Public Relations, Air Ministry, and a former Commanding Officer of the squadron, who sent the following reply:—

"Most grateful your cable re 605 Squadron ex-P.o.W., which I read out to-day to gathering of 605 Auxiliary officers in London. They asked me to express my warmest thanks to H.R.H. for his message and would be grateful if you would convey their cordial greetings to 605 ex-P.o.W. from Japan and say their return is anxiously awaited and that a squadron reunion will then be arranged. Grateful also if you could forward nominal roll giving home addresses, with any relevant information concerning other 605 P.o.W."

The County of Warwick Squadron, of which the returning men are members, was formed at Castle Bromwich in 1926, and, before going to the Far Eastern theatre of operations, had built up a formidable record in combat, having destroyed 167 enemy aircraft, probably destroyed 28, and damaged more than 130 others.

The squadron claimed its first Hun in 1940 while countering enemy attacks on Scapa Flow, and in the same year helped to cover the Dunkirk evacuation. The squadron was at Croydon for the Battle of Britain. During September and October, 1940, its pilots destroyed more than 40 enemy aircraft, probably destroyed 15, and damaged another 40 for the loss of six of their own aircraft.

In the following year they operated in defence of Malta, suffering great losses. The squadron was re-formed back in England in 1942 to attack targets in France, take part in many intruder patrols, and escort bombers to heavily defended targets. No. 605 left Fighter Command in November, 1944, to join the Second Tactical Air Force, and, flying Mosquitoes, harassed German communications.

Its members also destroyed 75 flying bombs.

Air Transport

A Résumé of the Presidential Address by Sir Frederick Handley Page to the Institute of Transport

IT might be symbolical that in this victory year the Institute of Transport's President should be representative of those interested in air transport and its future.

Sir Frederick was not sure that air transport lay close to the hearts of some members of the Institute. For example, in 1938, the President, Mr. Szlumper, found it difficult to foresee any great development of air transport in this country, and conjured up the fear of air-sickness as a deterrent.

Only two years ago Sir William Wood, in his address, dismissed air transport in one sentence, though he considered that the future of air transport "at least for overseas purposes and for difficult overland purposes, was obviously assured."

Sir Frederick, therefore, hoped to redress the balance as an enthusiast whose "faith was tempered with discretion."

They were meeting at a time of ferment in air transport. The war had compressed perhaps thirty years of normal technical development into less than six years. Many of these new technical developments promised much for the future. Jet or gas-turbine propulsion and its numerous derivatives, rocket power, radar, laminar flow, and low-drag aerofoils, were all capable of diversion to serve the needs of the transport operator.

A little farther from practical achievement was the controlled use of the atomic power. The amount of energy released by the "fission" of the uranium was approximately 25 million million ft./lb. per pound of the material.

The only vehicle in which very high power of a normal kind had been developed was the rocket bomb. Here for a very short space of time (approximately one minute) over 750,000 h.p. was developed. The useful load was only about 2,000 pounds, so that the weight carried per h.p. was but a small fraction of what more normal forms of transport would carry for the same expenditure of power.

Jet Prospects

The jet with its relatively high consumption found its first and most useful application in high altitude high-speed operation and was in consequence the most suited for fighter aircraft. Provided, however, that one flew high and fast enough jet-driven aircraft could be designed to have quite a useful range in spite of the high specific fuel consumption.

The gas-turbine with its power mainly directed to drive a propeller, as with the reciprocating engine, offered for the commercial aircraft a more reasonable fuel consumption and gave some freedom from vibration. The noise and vibration of the propeller would, however, still remain.

Research had concurrently been directed to the devising of laminar flow (low-drag) wing, the head resistance of which was perhaps less than one-third of that of the older type of aerofoil, and also to the development of knife-edge aerofoils designed to penetrate the sonic region where drag was so sharply increased by the shock wave.

Whilst these developments were most suited to high speed aircraft, the commercial operator looked to the development of aircraft more suited to traffic needs, and flying at a more normal speed, and to a reduction in the amount of power required per unit of load carried. Here the functional aspects of the design were of paramount importance.

The operator longed for a flying pantechnicon with doors which could be thrown wide open.

We saw here the transport aircraft developing in a different way to the bomber; for passengers, as well as for freight, large volume-carrying capacity was needed. Thus, for a commercial load of 16,000 lb. in the four-engined commercial *Hermes*, passengers and cargo space of 3,080 cub. ft. compared with only 425 cub. ft. for the carriage of the same bomb weight in the *Halifax*.

Of particular interest was the renewed attention given to the development of the flying wing in which normal wing and tail was replaced by a wing of swept-back plan form, a type which in the early days of his company was built and flown nearly 35 years ago. The elimination of the tail promised reduction in the fuselage drag and in the interference drag set up by the interaction of wings and body. For the operator the tailless aircraft gave ease of entry at the rear.

Important too was the saving in weight of the structures, as the freight could be distributed in cargo holds spanwise inside the wings. The wings there directly supported the load to be carried and were thus relieved of some of the stresses due to bending when the load was carried in the central fuselage.

Sir Frederick then compared the Halifax with the V/1500 of 1918.

Rapid Expansion?

What had happened, he said, was that in 25 years the aircraft had become denser. In spite of all improvements that were made, the weight of the structure increased disproportionately, and if very large aircraft were required, relief must be sought in a distribution of the cargo space and cargo spanwise across the wing.

Could we expect a growth in the use of air transport comparable with that achieved in the history of surface transport? Such transport had made a relatively slow start followed by a period of extremely rapid growth. Up to the outbreak of this war, airborne traffic had not entered an expansion period.

During the war the entire resources of British civil aviation had necessarily to aid our war effort, but it was encouraging to record, in spite of these difficulties, that in the year 1944-45, B.O.A.C. increased the passenger-miles and freight ton-miles by over 500 per cent. as compared with the results in 1940-41. Aircraft mileage flown increased about three times, and hours flown about two and a half times, so there was a considerable improvement in load carried per trip and also in cruising speed.

On the Service side of aviation the figures of Transport Command for the month of June last were very impressive —130,448 passengers were carried, 22,484 tons of freight and 3,715 tons of mail. Over 20,000,000 miles were flown.

Again, the statistics from Burma showed the large part that Transport Command played there., 14,800 passengers were carried, of which 4,500 were evacuated casualties. Freight amounted to 17,320 tons, and mail to 1,441 tons. Over 4,000,000 miles were flown.

In Europe alone, from D-day to VE-day, 141,261 passengers were carried, of whom 35,000 were prisoners of war. 122,075 evacuated casualties were also carried, and without one mishap despite flying in all weathers day and night. Freight and mail amounted to 38,940 short tons.

If American statistics were given, later in his paper, in greater detail than British ones, this was due to the fact that American civil aviation continued to function during the war.

In the U.S.A. in 1940, air travel amounted to 1,000,000,000 passenger-miles, and Pullman travel by rail to 7,000,000,000 passenger-miles. Inter-city coach travel by rail was just under 13,000,000,000 passenger-miles. Travel by bus was 11,000,000,000 passenger-miles. In 1942 air travel rose to 1,389,000,000 passenger-miles and in 1943 to 1,632,000,000. It was now about 3.000,000,000 passenger-miles. It had been forecast to reach 7,000,000,000 pas-

senger-miles by 1950, a sevenfold increase in ten years, and equivalent in total to that of the 1940 Pullman traffic.

The corresponding figures for rail and bus had shown even greater increases in the same period, but various war-time factors, such as the restriction on use of private passenger cars, had affected the totals and the comparison. The extrapolation of the pre-war curves was, therefore, not a sure enough basis on which to assess post-war probabilities and makes it difficult to judge whether or not the beginning of air transport expansion started in this country and the U.S.A. in 1933-1935, as some signs would seem to indicate.

Contrasts had been made of an aircraft cost of 30d. per ton-mile, and shipping cargo costs of less than 1/30th of a penny per ton-mile, so that passage by air would cost you 900 times as much as passage in a tramp steamer. Clearly the carrying trade catered for was quite different, and in fact it had been stated that air transport would cut much more into message traffic than into surface carrying trade, as so many more people would travel to settle matters by interview rather than by cable or letter. Much more likely was the result that with this added means of international and imperial communication new traffic would be created and the sum total would increase.

AIR TRANSPORT (CONTINUED)

Fares would naturally vary accordingly to the length of the non-stop stage flown, but passenger fares between 3½ and 4 cents per mile seemed feasible in the future, compared with rather more than 5 cents per mile at the present time, provided that something like a two-thirds load factor could be achieved.

We had already reached a stage where air passenger costs were getting very close to first-class railway fares. Sir Frederick showed a table which suggested clearly that, in many cases, the air fare between cities in the U.S. was actually lower than that for first-class railway travel.

Speed in itself brought many advantages, not the least that the effect of headwinds, so potent a factor against the regularity of services just after the last war, was greatly minimised. Air transport was that much less dependent on weather. Moreover, comfort and safety had both materially improved; British Overseas Airways Corporation was able to quote passenger insurance rates exactly the same as those charged for travel by sea. Speed, in other words, had increased enormously without a corresponding increase in operational costs.

Disproportionate Costs

A break-up of operational costs emphasised the relative magnitude of fuel and oil charges and of the cost of maintenance. Figures had been quoted giving 18 per cent. for fuel and oil cost, 12 per cent. for maintenance, and only 3 per cent. for depreciation. These indicated the relative unimportance of first cost of airline equipment and suggested that expensive improvements in design might be well worth while if they secured greater economy in use of fuel and oil, or simpler and quicker maintenance.

Obviously, up to the present the United States had had a great advantage in cheapness of fuel. Before the war, Imperial Airways fuel costs averaged approximately three times as much per imperial gallon as those of the American domestic air-lines—2s. 3d. per gallon against 10d.

Jet propulsion units burnt cheap fuel, but it was by no means impossible that costs of kerosene might jump if the demand went up.

American figures showed that in 1941 air transport was responsible for one death in approximately every 45,000,000 passenger-miles. In the same year, the U.S. authorities recorded one death for every 36,000,000 passenger-miles travelled in private automobiles.

The word "speed" embraced more than the speed of the vehicle. It includes speed from the time when the intending passenger makes his decision to travel. This involved brief intervals between services in comparison with competing forms of transport. Airline operators were attaching great value to frequency of service, which favoured the use of aircraft of the smallest size compatible with distance to be flown. Generally, it was better to have smaller craft departing frequently than larger craft departing at much longer intervals. Obviously, the statement could not be pushed too far. There was an optimum size of airliner for a given volume of traffic for every length of haul. For example, an airliner designed for journeys in still air of 4,500 miles—a non-stop crossing between London and New York plus an adequate margin of range to overcome adverse weather—must, with present-day power plants, be large if it is to transport a reasonable pay-load as well as enough fuel. On the other hand, quite a small aircraft might be adequate for high-frequency services over distances of about 200 miles.

Frequency must be appropriate to the traffic available. Aircraft do not run efficiently with 100 per cent. loads, which involved a system of priorities and did not give a cushion of marginal capacity to accommodate the passenger who made up his mind to travel at the last moment, but they should if possible not go far below 70 per cent. of capacity. Most operating schedules nowadays were worked out on the assumption of an average use of some 60 to 65 per cent. of total capacity.

Maximum Utilisation

The adoption of relatively small aircraft did not mean that the loads transported over the airlines would be negligible. The aeroplane attained a very high degree of utilisation, amounting nowadays in actual operation to as much as fourteen hours out of every twenty-four. The experience of the American domestic air lines was again illuminating. In 1940, 338 aircraft flew 1,000,000,000 passenger-miles. During the next few months the airlines lost half of their fleets to the Services, yet in 1942, with only 165 airliners, passenger-miles accomplished rose to 1,389,000,000, and in 1943 to 1,632,000,000.

For the sevenfold air passenger increase forecast for 1950—compared with 1940—the Curtiss-Wright Business Research Department calculated that an aggregate of not more than 570 aircraft would be required with an average capacity of twice the present-day standard.

How fast would the post-war airliner fly? Economic speeds deserving consideration in commercial air transport were still far below Service aircraft level

A safe generalisation was that the 150-180 m.p.h. which was a reasonable economic speed before the war could be increased in more modern aircraft to 200-225 m.p.h., due to improved aerodynamical form and the use of high engine boost to improve take-off with heavy loads at the high wing loadings. Research into laminar flow and improved aerofoils should greatly decrease "drag" and it was possible to envisage 300 m.p.h. as a cruising speed attainable in the next few years without more expenditure of power. Jet propulsion promised a long step forward, but there was yet much to learn in ways and means of reducing the weight of fuel consumed by the jet or gas turbine.

By way of present example, Sir Frederick gave the figures for the *Hermes*.

Yet another aspect of distance was gained if the world was redrawn on the basis of freight-rates, whereby countries between which freight rates were low were shown relatively close together and those between which freight rates were high were shown far apart. When completed, such a map revealed the astonishing advantage of seaborne freight over any other form of transport, and explained why sea communication and a favourable position on the world's sea highways had earned Great Britain her predominance.

Air transport was obviously more international in its scope than any other form of transport. Hence, air transport could only be fairly surveyed from the global angle of approach. It must infallibly abolish the geographical separation of sea and mountain which had led to varying civilisations, and would tend to make the entire world one unit.

CIVIL AVIATION

Pre-Service Testing

B.O.A.C.'s Development Flight : Preparing Civil Equipment and Prototypes for Service

THE fact that any new civil transport has passed its normal tests does not mean that the aircraft is ready for immediate operation. Not only may there be troubles of a kind peculiar to long-distance day-by-day flying, which must be cleared up before later types are put into service, but a great mass of necessary information must be obtained in order that the aircraft may be flown to best advantage on the different sections of the routes and so that the maintenance personnel may be *au fait* with the various servicing problems. Furthermore, new ancillary items and engines, as they appear, must be tested under conditions comparable to line flying before they are put into regular service.

In the old days, of course, both Imperial Airways and British Airways had "de-snagging" branches, and, after the merger, the two branches were included in a Department of Technical Development and Production. This department, during the past few years, has been responsible for military-civil conversions, for the tests of the resulting types—including Liberators, Sunderlands, Hudsons, Mosquitoes and Curtiss-Wright 20s.—and for the clearing of defects. Later on, after discussions with the D.G.C.A. and M.A.P., an entirely separate branch was formed by the Corporation.

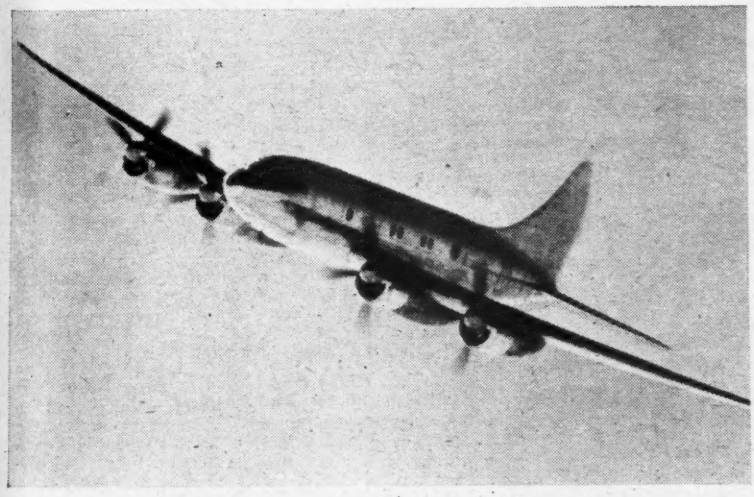
This was known as the Development Flight and it came into official being in April last year, its first aircraft, a Lancaster for engine tests, having been taken over from R.A.F. Bomber Command several months previously. In those days the only full-time members of the Flight were Capt. R. G. Buck, in charge of the flying, and Mr. Haigh, in charge of the engineering side. It was obvious that a very great deal of work would need to be done, and that this work would rapidly increase as and when new types came into being. More recently, therefore, a Project Branch was formed under Mr. C. H. Jackson, with the Development Flight, under Group Capt. E. L. Mole, as a complementary. At present there are four full-time crews, under Captains Buck, Reid, Farnsworth and Satchwell, carrying out development testing for the Corporation.

It should be stressed here that these crews have been chosen not only for their technical qualifications but also for their wide experience on the routes, and that the test work is, where necessary, actually carried out over the different routes. The Lancaster, for instance, acted as a flying test-bed for the civil Merlin "hundred" series which was standard in the Yorks then being delivered, and in the Lancastrian, and would, in developed form, be duly fitted to the Tudors. Extensive flight tests were carried out to determine the specific fuel consumption under all conditions—information which was to be of immense value when the Lancastrian went into service and faced the 3,100-mile stage across the Indian Ocean. On one test the Lancaster was flown, in the days when France was occupied, round Gibraltar to Cairo, a distance of 3,650 miles non-stop.

Again, with the arrival of the Lancastrian, the Flight carried out all its initial performance tests at Cairo, flew it back to this country for necessary modifications and test analysis, and then, with a duplicate crew, flew this machine to New Zealand, landing there 3½ days later. The actual flying time for the trip was 53 hr. 13 min.—giving an average speed of 250 m.p.h.

Cruising Control

The questions involved in what is known as "cruising control"—in other words, the required boost and revolutions to be maintained in different conditions for maximum efficiency—were particularly important for the service which was later to be operated by the Lancastrians. During the initial tests it was decided that a very fast schedule would be possible on certain stages without prejudice to the payload. It was known that extreme accuracy in engine control would be absolutely essential on the stage between Ceylon and Exmouth Gulf, in Australia. Though still not definite, experience with the Lancastrian suggested that the use of higher power outputs might even increase engine life and the experiments are now continuing in actual service with the Yorks. Again, investigations have been made to pin down the relationship between induction charge and intake temperatures in an effort to reduce the amount of trouble caused by tetra-ethyl-lead attack when using high octane fuels.



Next on the list for operational test by B.O.A.C.'s Development Flight will be the Avro Tudor. The fully tropicalised "circular" Merlin 100 series engines have been undergoing thorough development tests in the Flight's Lancaster.

At the moment, intensive test flights are being made with Bristol Centaurus engines installed in a Warwick and, at the time of writing, this aircraft is in South Africa. An interesting feature of this test-bed Warwick is the fitting of torque meters. Centaurus engines are, of course, fitted to the new Short Shetland boats and will no doubt be fitted to other aircraft put into service by B.O.A.C. In due course, therefore, the Development Flight will have garnered all the necessary information about the handling and maintenance of these engines, thus reducing the time taken up in pre-service trials with the later aircraft.

Liaison between manufacturers and the Corporation must necessarily be more and more important, and it is interesting to know that, on the Lancastrian tests, representatives of A. V. Roe, Rolls-Royce, the Asiatic Petroleum Company and M.A.P. were carried. During both the Lancaster and Lancastrian trials a number of ancillary items were tested from time to

PRE-SERVICE TESTING

time at the request of M.A.P. Within the next few months the Flight will be dealing with the Tudor.

It is possible to mention only a few of the more obvious lines of investigation and test which must be followed by the Development Flight. Undoubtedly, from the operational point of view, the laying-down of recommended cruising and climbing powers is the most important, but a hundred and one other items are requiring and will duly require investigation and report. For instance, the appearance of pressurised cabins will involve the Flight in a great deal of experimental work, since however effective this pressurisation may be in preliminary tests, the proof of the pudding will still be in the eating, and its performance on the routes, in all conditions of temperature and humidity, must be thoroughly checked before it can be used in normal service with passengers of varying medical fitness. Oxygen equipment may require modification before being safely handled by these same passengers, and the feed-lines may tend to develop troubles of one kind or another in tropical conditions. Cabin heating, too, can still be an endless source of minor difficulty.

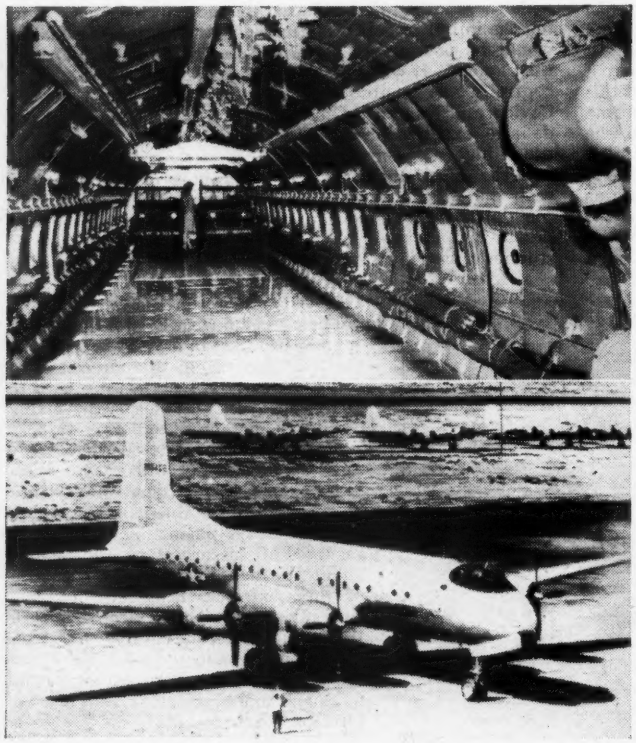
The Flight must standardise approved take-off and other "drill" between the various members of the crew for each new type as it appears. Maintenance schedules must be worked out, in liaison with the manufacturers, and books prepared, while some form of "snag" return from maintenance personnel all over the world must be organised if duplication of work is to be reduced and if reports on "basic" faults are to get back to the manufacturers for attention on any later aircraft in the series. The "book" work, alone, is an immense task.

Meanwhile, thanks to low permitted priorities in building work, the Flight is carrying on at Hurn under very difficult conditions and tends to be short of certain kinds of technical personnel. Hurn is, of course, laid out on the dispersed Service plan, which, though excellent for avoiding concentrated bomb damage, is hardly suited to normal working. There is no heat laid on in the hangars and none of these is large enough to house the Tudor, which, when it arrives, will have to be farmed out to an R.A.F. station with a B.O.A.C. maintenance detachment—a situation hardly conducive to efficiency. Until February of this year the Corporation used Lyneham, which they shared with R.A.F. Transport Command and a Maintenance Unit; they were given just four days in which to get out and arrange themselves at Hurn. But, as always in our English way, individual enthusiasm and energy kept the Flight and the Services going.

CIVIL AVIATION NEWS

THE LAST OF THE ENSIGNS

AFTER some seven years of service with B.O.A.C. the Armstrong-Whitworth Ensigns are to be retired. As and when the aircraft come up for their C. of A.s they will be scrapped. The Ensigns, at the time of their first appearance in 1937, were the logical development, on modern lines, of the old Imperial Airways' school of thought. They were large, comfortable and, for their day, quite reasonably fast—and certainly a great deal faster than the aircraft which they replaced. They were ordered to operate in "parallel," so to speak, with the Empire boats.



GLOBEMASTER: The somewhat flamboyantly named Douglas C.74, the nominal successor to the Skymaster, appears to have ample unobstructed fuselage space. In the background of the interior picture above two Jeeps may be seen. The Globemaster is unofficially credited with a range of 7,800 miles—load unspecified.

FULL CIRCLE

LAST week B.O.A.C. started regular flying boat operations between Poole and Rangoon, using Sunderlands. Four services will be run every week each way, with two additional services between this country and Calcutta. In due course the service will be extended to Singapore. Thus history makes a full circle and the classic Empire route, in its original form, is reopened. The first service from Rangoon left on October 13 and the first from Poole on October 9.

On the same day a B.O.A.C. Lancastrian left Hurn on a survey flight to South America. Operational data, preparatory to starting a regular service, will be collected by representatives of the Ministry of Civil Aviation, B.O.A.C. and British Latin-American Air Lines, now renamed British South American Airways.

ATLANTIC CHANGE-OVER

ON October 14 the last B.O.A.C. Atlantic service over the northern route was scheduled. From now on, and until the Tudors are in service, the Boeing 314A Clippers will be taken over the southern route, once a week, by West Africa and Brazil.

Incidentally, the three old Boeing 314A Clippers, *Bristol*, *Berwick* and *Bangor*, have quietly topped the million-mile mark, one of them, *Bristol*, having flown 1,100,513 miles. These aircraft were bought from Pan American in 1941 to fill the Empire fleet gaps. The 314A differed from the original 314 in engine type and in tankage to bring the still-air range up to a maximum of something better than 4,500 miles. These three aircraft have recently been averaging four Atlantic services weekly, between Baltimore, Botwood, Foynes and Poole.

TO THE CHANNEL ISLANDS

ON and after this week Jersey Airways will be operating separate services to Jersey and Guernsey. The morning service, leaving Victoria Coach Station at 9 a.m., will go to Guernsey, and the afternoon service, leaving at 1 p.m., to Jersey. Using D.H. 89s—alias Dominies, alias Rapides—the Channel Island service has been in operation since June for passengers with the necessary permission to travel.

Changes in R.A.F. Higher Appointments

Air Marshal Sir Arthur Barratt to be Inspector General

AIR CHIEF MARSHAL SIR EDGAR LUDLOW HEWITT, G.B.E., K.C.B., C.M.G., D.S.O., M.C., has relinquished his appointment as Inspector-General of the Royal Air Force and will shortly retire from the Service, the Air Ministry has announced.

He will be succeeded as Inspector-General by Air Marshal Sir Arthur Barratt, K.C.B., C.M.G., M.C., at present C.-in-C. Technical Training Command.

Air Marshal Sir Ralph Sorley, K.C.B., O.B.E., D.S.C., D.F.C., at present Controller of Research and Development at the Ministry of Aircraft Production, has been appointed C.-in-C. Technical Training Command.

Air Marshal William Alec Coryton, K.B.E., C.B., M.V.O., D.F.C., will succeed Air Marshal Sorley as Controller of Research and Development at the M.A.P.

Air Chief Marshal Sir Edgar Rainey Ludlow Hewitt has been Inspector-General of the Royal Air Force since April, 1940. He was A.O.C.-in-C. of Bomber Command from September, 1937, until that date.

Seconded to the R.F.C. from the Royal Irish Rifles in August, 1914, having qualified as a pilot in the same month, he served in France from March, 1916, with intervals until the end of the war.

After the war he was for a time at the Air Ministry, and subsequently held a number of senior appointments at home and abroad. He was appointed Air Chief Marshal in July, 1937.

Air Marshal Sir Arthur Sheridan Barratt has been A.O.C.-in-C. Technical Training Command since June, 1943, when he relinquished the post of A.O.C.-in-C. Army Co-operation Command on that Command being merged into the Tactical Air Force.

In 1914 he was seconded from the Royal Artillery for flying duties in France with the R.F.C., and in 1918-19 was at R.A.F. G.H.Q., Cologne, with the British Army of Occupation. Between the two wars he held many important posts, and was appointed Air Marshal in July, 1939.

Early in 1940 he became A.O.C.-in-C. of the British Air Forces in France, and after his return to England on the evacuation of the B.A.F.F., he took charge of Army Co-operation Command when it was formed late in 1940.

Air Marshal Sir Ralph Squire Sorley has been Controller of Research and Development in the Ministry of Aircraft Production since April, 1943. He is also a Member of the Aircraft Supply Council and an additional Member of the Air Council. He had previously been Assistant Chief of the Air Staff (Operational Requirements and Tactics) and in command of the Aeroplane and Armament Experimental Establishment. He served in the R.N.A.S. in the last war, and received a permanent commission in the Royal Air Force as flying officer in 1919. Since then he has held a number of appointments, here and overseas, and early in 1939 commanded a bomber station in No. 2 (Bomber) Group, later in the same year becoming Senior Air Staff Officer, No. 6 Group.

Air Marshal William Alec Coryton has been Assistant Air Commander of Eastern Air Command in South-East Asia, and also Air Marshal Commanding the R.A.F. in Bengal and Burma since January this year . Before going to South-East Asia in August, 1944, as A.O.C. the Third Tactical Air Force, he was for a year Assistant Chief of Air Staff (Operations) at the Air Ministry.

Commissioned in the Rifle Brigade in September, 1914, he transferred to the R.A.F. in April, 1918, and has seen service in India, Iraq, and the Middle East.

"JOURNEY TOGETHER"

IT would certainly seem, most happily, that the technique of film making has advanced almost as much, during the recent war, as that of making the aircraft themselves. We refer in particular to British films dealing with British Service life and we are, of course, only concerned here with Service aviation. Thoughts of American film stars capturing Burma practically single-handed make us hesitate to extend the compliment any further.

"Journey Together," which we had the opportunity of seeing last week, might possibly be described as coming in the semi-documentary category if we were not afraid of the term frightening people away from it. For it must be admitted that the days when documentary and dull were synonymous terms are not so far behind that everyone has forgotten the fact. But there is no need to doubt the entertainment value of this story of two young men whose great ambition is to become R.A.F. pilots, for the R.A.F. Film Unit has made a really magnificent job of it from every point of view. What happens to these young men must have happened to many thousands, and there is an authenticity about the details and the general atmosphere which every man in the Service will applaud.

The main purpose behind this excellent production is to show, above all else, that no one member of a bomber crew is any more important than another, and it achieves this without the slightest suspicion of preaching or putting over propaganda. The story, very briefly, is this: Two pals start their initial training together as embryo pilots. One proves to be not so bright in the classroom, but to have a real flair for flying. The other uses his brains to good effect in the classroom and, once in the air, can fly in perfect textbook fashion, but he lacks that judgment of height so necessary to put an aircraft back on the ground safely; he just cannot learn to land.

He is so thoroughly disheartened by this that, when he is switched to a navigator's course, he only studies half-heartedly until something happens (go and see it to find out what) to make him realise that a navigator's job is every bit as big as that of a pilot. The two pals come together again in a Lancaster squadron in England after their training in the U.S. and Canada, and when their Lanc. is badly hit by *flak* over Berlin and they have to ditch it in the North Sea, it is the young navigator on whom the lives of the crew principally depend.

There is a delightful sprinkling of humour throughout this film—delightful because it really fits—the flying sequences are admirable, and the final ditching scenes as convincing as they are gripping. As one instance of the intelligent direction on which the whole atmosphere of the picture is built, we may instance the shot of the empty crew-room in which the only movement is a spiral of smoke from a stubbed-out cigarette, and the only sound the steadily mounting roar of the Lancasters taking off for Berlin.

Coming now, "Journey Together" is either a little late or much too early; in ten years' time it could have been another "Dawn Patrol." Perhaps that is why this first-class production is only being rated as a "second feature" release. But whatever you do, don't miss it.

FLT. LT. J. G. SETH-SMITH

IT is with the most profound regret that we record the death of John Seth-Smith, who, whilst test-flying a Firefly for the Fairey Aviation Co., Ltd., crashed on Barnes Common on September 13th, 1945.

John Seth-Smith was 28 years old and had a wider circle of friends than most people can hope to have. He was educated at Stowe and joined the Essex Yeomanry before the war as a Territorial, receiving his commission shortly before Dunkirk, through which he came with his regiment.

Transferring to the R.A.F. in 1941, he joined No. 168 Army Co-operation Squadron and later flew over France with the first Mustangs with which his squadron was equipped. He was injured in a flying accident in the early part of 1944, and as soon as he recovered tried hard to get back in the air. Although with a pronounced limp, he managed, solely by his own effort, to be placed upon the Special Duties list, and was then lent to Faireys, whom he joined in July, 1944. He started test-flying in September, 1944, and did a first-class job of work in that field.

Nothing was ever too much trouble for John, and he brought the most spontaneous enthusiasm to any task or problem. His was an utterly charming and fun-loving character, and everyone who knew him is the poorer for his loss. C. B. B.-W.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

GLOSTER METEOR IN ACTION

A Slight Trail Sometimes Seen

WITHOUT wishing to start a controversy on the above-mentioned subject, I would like to state that for the last eighteen months I have been in a position to observe the take-off and flight of this aircraft, using different units, and I have yet to see "a pall of what appears to be black smoke left around the starting point" as disclosed by H. M. Absolon.

Granted, a *slight* trail of smoke is sometimes seen on acceleration climb or perhaps boost, but is not, so far as I can judge, constant.

I am a non-technician, so perhaps "someone in the know" will enlighten us. "VILLAGER."

OVER MOUNT EVEREST

Automatic Relief Valve

IN the caption which accompanied the photograph of an R.A.F. Mosquito flying over Mount Everest, appearing on p. 354, of *Flight*, September 27th, it is recalled that such a flight was first achieved by two Westland aircraft in April, 1933.

In this connection it is interesting to note that Westland's also contributed to this latest conquest; the "heart" of the Mosquito pressure cabin being an intricate control valve, designed by Westland's, which has been the outcome of engineering research awakened by such early pioneering flights.

R. M. SELLENS.

WHAT'S IN A NAME?

Spitefulness is Not a Virtue

GROUP CAPT. S. L. Quine objects to the name "Vampire" (*Flight*, Sept. 27th), but I suggest that "Spiteful" is even less desirable.

Patently the object in this instance was to use a name not too dissimilar from Spitfire, but I feel that this purely superficial link has been maintained at too great a price. Spitefulness is not a virtue; in fact, it is a particularly nasty trait in any character, and while I have no doubt whatever that the aircraft so named will prove itself to be such an excellent one that it will easily live down its unfortunate "handle," I feel it might have been given a flying start in life by gracing it with a far less obnoxious title. Its Naval equivalent, the Seafang, has been much more fortunate in this respect.

NORMAN DOWNES.

CIVIL R/T RESTORED

Boon to Internal Airlines

ON September 5th Mr. E. L. Gandar Dower, M.P., managing director of Allied Airways (Gandar Dower), Ltd., tabled a question for the Parliamentary Secretary to the Ministry of Civil Aviation. The question read as follows:—

> "To ask the Parliamentary Secretary to the Ministry of Civil Aviation whether he will now permit internal airlines to operate radio telephony for wireless guidance under the same conditions as existed prior to war."

This question was tabled while the House was in recess, but permission has already been given to use radio telephony on the Aberdeen and Inverness, Orkney and Shetland air services.

This decision, which again permits civil pilots to use voice transmission instead of radio telegraphy, will prove a great boon to the airlines concerned. As it eliminates the necessity of carrying a separate wireless operator, one advantage will be to provide more accommodation on aircraft for passengers.

JOHN A. CAMERON (Press Officer),
Allied Airways.

"THE TUNE HAS CHANGED"

What a Senior R.A.F. Officer Said

I HEARTILY agree with views expressed by "One of the Many" following your bold leading article 6/9/45.

The success of the A.T.C. was entirely due to the keenness of the officers, who did their job after putting in long hours at their own work or businesses. Very little practical help came from the V.I.P.s, but the officers slogged along cheerfully and often met considerable out-of-pocket expenses. Surely the Defence Medal should be granted to A.T.C. officers along with the Home Guard, wardens, N.F.S., fire watchers, etc.

The writer was a warden in 1938 and did a lot of work in organising the practical side of A.R.P. in his own district (7,000 population), including recruiting and training the voluntary street fire parties. He went over to the A.T.C. as the training of lads for the R.A.F., etc., was far more important than passive defence.

The Air Ministry's appeal for officers is now tragic when one recalls that nine months ago a senior R.A.F. officer of standing told many of us at a conference that, in view of altered conditions, "resignations would not be frowned on." This was followed up by calling for resignations in a nearby large city on amalgamation of squadrons—now I hear they are wanting officers there.

"Gong or no gong," we can look back on a wartime voluntary job well done, knowing that we contributed much more to the war effort than the many who watched and waited, necessary as it was. "ANOTHER OF THE MANY."

REFUELLING IN FLIGHT

Assisted Take-off Will Make It Obsolete

I HAVE read in several recent issues articles on "Refuelling in Flight," but I have never noticed the name of Capt. Nicolson coupled with refuelling in the air.

It is now a very long time ago that I had the privilege of reading his master patent, which covered not only refuelling, but transferring articles in the air. From memory I believe that Capt. Nicolson, in conjunction with the late John Lord (two of the directors of Saunders-Roe), were working on this scheme not long after the 1914-19 war. I met Capt. Nicolson some time ago, and I remember we discussed flight refuelling, and he mentioned to me that he had since taken out patents covering "Assisted Take-offs," which he thought would ultimately make flight refuelling (as known to-day) a thing of the past.

In my opinion, flight refuelling was an asset up to the outbreak of war, but with subsequent developments in aircraft design the principle of flight refuelling is obsolete. If a sound principle for assisted take-off is introduced (and it is that field where future developments should lie), there can be no use for refuelling in the air unless it be for endurance records.

F. HUNTLEY.

Comparison of Systems

A GREAT deal of publicity has recently been given to Sir Alan Cobham's system of refuelling in the air. It would be interesting if any of your contributors could let me know how Sir Alan's system compares with Capt. Nicolson's system. About 20 years ago I investigated Nicolson's patent, and came to the conclusion that if anyone tried "refuelling in the air" they were bound to encroach on his patent, as he appeared to cover every aspect of the problem.

At the time Capt. Nicolson took out his patent he was a director of Saunders-Roe, and employed Mr. Marcus Langley as one of his leading designers, and later I found that Mr. Langley had joined Sir Alan Cobham's company. It is therefore obvious that if Nicolson and Langley would give their combined views, we would then be in a position to judge what contribution refuelling in the air could make to post-war air transport.

As Capt. Nicolson and Mr. Langley are both naval architects by profession their advice should be of particular interest to flying boat designers. I feel sure that many of your readers will appreciate the importance of this interesting subject.

CHAS. A. HORNSBY, A.R.Ae.S.

[Sir Alan Cobham's system is based on Capt. Nicolson's patents. Sir Alan purchased the patent rights.—ED.]

EARTHBOUND NEUROSIS

A New Disease Suffered by Ex-aircrew "Releases"?

ONE way or another a lot of new diseases, mainly of nervous origin, have been discovered or invented during the last decade. Very shortly, it seems to me, we shall be able to add yet another if the boys at the top can't very soon make up their minds about the future of civil aviation—and, in particular, the sort of civil aviation which concerns the private individual.

I refer to neurosis of the earthbound—a savage and contagious complaint. Some thousands of people who have lived in and for the air will soon be loosed on an aircraftless and innocent world. For the first few weeks, perhaps, they will be glad of the rest and the change. Then, gradually at first,

CORRESPONDENCE

the itch will return to the palms of the hands, and if release of some kind is not organised we shall have aircraft stolen from R.A.F. stations and bodies falling with collapsed umbrellas from high buildings.

It is no ordinary craving, this. It settles in the very marrow of the bones. The spectre of the atom bomb is as nothing to the still more gaunt spectres which will soon be seen abroad—those of the men and women torn from their aircraft. Already the disease can be seen in the Air Force itself, where thousands of aircrew are eating their hearts out on the ground.

If nothing can be done to satisfy the need, then I earnestly advise the Ministry of Health to arrange for doctors, ambulances and hospitals to stand by for the crack-ups.

S.W.3. "JEREMIAH."

CAMPAIGN AWARDS

Aircrew Europe Star a Time Award

THE Fleet Air Arm gentleman that feels maltreated about the "Aircrew Europe Star" should take comfort in the fact that it is not really a campaign star and is of very little consequence. It is purely a time award. It is given *ad lib.* to any member of aircrew who has done *one* operation prior to D-DAY (even if L.M.F. after it), whereas a tour or more of operations since that date counts for nothing more than the "France and Germany Star," which ground personnel also receive. ANOTHER MISFIT.

DEFLEX-REACTION PROPULSION

No Improvement Possible

YOU invite criticism of Mr. Umpleby's article in *Flight*, September 13th issue, so here goes:—

(1) It is well known that the greater the (properly directed) exhaust velocity, relative to the aircraft, the greater the effective thrust. And all experience of the flow of a gas in a pipe, *e.g.*, high-speed petrol engines, goes to show that the less you bend it about, vary its cross-sectional area and so on, the faster it will flow. The example of the wave in the river mentioned by Mr. Umpleby is a case in point. A variation of cross-section induces a wave which requires a lot of energy to produce it, which energy can only be supplied at the expense of the speed of the current.

(2) I am not sure that I understand "in the case of purely axial flow the momentum of the gas stream in relation to the acceleration of the fluid is reduced by an amount equivalent to the velocity of flight," but it is well known that the exhaust velocity relative to the machine may be less than the flight velocity relative to the starting point. And this is not surprising. A fireproof engineer sitting in the furnace could not know, except by a possible slight "ram effect," whether the machine was moving fast or slowly.

(3) I do not agree that "as the velocity of flight increases the effective propulsion force decreases." The velocity of flight does not go on increasing indefinitely owing to head resistance and drag, and because all the air picked up by the blower has to be accelerated from rest to the velocity of the aircraft. The propelling force probably increases with increased velocity owing to ram effect.

(4) Equation (1) does not seem to me correct. Newton recorded the fact that the pushing force (in poundals) is equal to the mass (in lbs.) multiplied by the acceleration (*i.e.*, the ft. per sec. of velocity added every second to the velocity of the mass). A pound *weight* is g poundals and is slightly variable, but engineers measure stresses, thrusts, etc., in lbs. Therefore, starting from

$$T \text{ poundals} = \text{W.lb. mass} \times (V - V_1) \text{ acceleration}$$

we get

$$\frac{T}{g}\text{lb.} = V - V_1)\ W$$

or

$$T = (V - V_1)\ W.g.$$

To return to general considerations, essentially a J.P. unit consists of a blower blowing air into an oil-fed furnace (a volume multiplier), a turbine giving the free-est possible passage to the furnace gases consistent with its developing sufficient speed and torque to drive the blower to which it is coupled, and an expansion chamber leading as smoothly as possible to a jet-nozzle which is as large as possible consistent with the furnace pressure being maintained at the pressure which the blower can provide.

The function of the furnace is to maintain, by multiplying the gas volume, the pressure supplied by the blower, in spite of the open hole at the tail end of the chamber. So that one end of the force we are using for propulsion is taken by mechanism fixed to the aircraft and so transmitted to the aircraft and the other end is used, as nearly as possible exclusively, to accelerate the gas in the chamber. Any obstructions, rough surfaces, baffle plates, turbines or ducts, cause a negative thrust which leaves so much less for the essential purpose of accelerating the gases at one end and the aircraft at the other. This seems to leave no room for improvement by deflection.

A boat will often sail faster with a beam wind than with a following wind, which looks at first sight like an argument for the deflection principle, but the reason is that as the boat gains speed the relative wind falls off, whereas the jet propulsion unit carries its own constant pressure with it. Rockets have been constructed squirting in the direction of flight and using a sort of little umbrella completely to reverse the blast, but that was for stability reasons—nobody claimed increased thrust. A Pelton wheel is an outstanding example of complete reversal, but that again is for constructional and mechanical reasons—a glorified lawn sprinkler would, in theory, be more efficient when running at speed.

In short, it appears to me that the jet propulsion principle is unique in that the machine using it cannot run away from the force which is driving it, because the force originates in the machine, and, therefore, there is no hope of improving thrust or speed by any adaptation of the inclined plane principle. L. SHELFORD BIDWELL.

[A letter from Mr. Umpleby points out that the equation (4) in the original article should have been Axial Thrust in Flight

$$R \text{ or } T = \frac{W}{g}(V - V_1) - v.$$

—ED.]

Mr. Umpleby Replies to His Critics

FIRST I wish to thank everyone who has so kindly commented on my article in the issue of *Flight* of September 13th, even though, up to the moment, we are disagreed. I trust they will accept a general reply concerning their various comments in place of individual treatment.

In the case of axial flow the stuff flows through the jet unit axially from inlet to outlet. The charge at the inlet must have a certain ingoing velocity, and the change of momentum within the unit is the difference between inlet and exit velocities. If in flight the aircraft velocity reaches the efflux velocity there is no change in momentum within the unit, relative to the aircraft, no work is done in the unit and no thrust is generated.

Intermediate velocities develop intermediate thrusts which vary in accordance with the respective velocities, as shown in Fig. 3, curve c.

A body travels in a straight line unless it is acted upon by a force which changes its direction (Newton's First Law). This force has also its equal and opposite reaction (Newton's Third Law), and gas molecules are small bodies whose deflection imposes reaction upon the structure.

If a constant mass of stuff is being deflected at a constant rate, a constant reaction force is generated, and it is independent of the speed of flight. If the stuff passed through the unit at the efflux velocity, and the aircraft attained efflux velocity, a constant reaction force would still be generated. This is the important difference between axial jet propulsion and reflex reaction propulsion, particularly round about the 600 m.p.h. mark. The ram effect would increase the density of the air at the compressor inlets.

If the deflex propulsion failed to act in this way the turbine, which is operated by deflected stuff, could not operate effectively at high flight velocities. Axial change in momentum and deflection can operate simultaneously in the same unit and both contribute thrust (Newton's Second Law).

The next question that arises is: can deflection be so arranged as to provide useful forwardly acting thrust? This is answered in Fig. 5, which is admittedly one particular development; it is not the only possible development, nor perhaps the most efficient for every requirement. Other circumstances may require other treatments. The gas friction, eddy losses and turbulence can be reduced by scientific design, and "the proof of the pudding is in the eating thereof."

The rocket referred to is, I suppose, the Oberth, a number of which were built and tested in Germany. They worked well, but nothing much seems to be known about them. The writer has given these rockets some thought and investigation, and may give some results of the investigations later, if they should be of sufficient interest. F. UMPLEBY.

SERVICE AVIATION

A HAND FROM THE NAVY : No. 132 (Bombay) Squadron, which is responsible for the air defence of Hong Kong, was taken to its destination by the Royal Navy. This picture shows Spitfire XIVs of the Squadron lined up on the flight deck of H.M.S. *Smiter*, as it steams into Hong Kong harbour.

Royal Air Force and Fleet Air Arm News and Announcements

Royal Air Force

Promotion

General Duties Branch.

Temp. Air Comdre. (Act. Air Vice-Marshal) S. E. STORRAR, C.B.E., is granted the rank of Air Comdre. (war subs.), September 4th, 1945.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations :—

Bar to Distinguished Service Order

Act. Wing Cdr. P. B. LUCAS, D.S.O., D.F.C., R.A.F.V.R., No. 613 Sqn.—Since the award of the D.S.O. Wing Cdr. Lucas has taken part in many attacks against the enemy's lines of communication and has destroyed or damaged numerous mechanical transports and railway facilities. Many of these sorties have been flown during appalling weather and in the face of heavy enemy opposition. The outstanding leadership and conspicuous courage of this officer have been reflected in the high standard of operational efficiency maintained by his squadron.

Distinguished Service Order

Act. Sqn. Ldr. N. CAMERON, D.F.C., R.A.F.V.R., No. 258 Sqn.—This officer has a long record of operational flying and has served in England, Russia, the Western Desert and Burma. Since the award of the D.F.C. he has led his squadron on many sorties over Burma. An outstanding leader, Sqn. Ldr. Cameron has always displayed keenness, determination and courage, setting an inspiring example to the other pilots in his squadron.

Act. Sqn. Ldr. R. F. T. DOE, D.F.C., R.A.F.O., No. 10 (R.I.A.F.) Sqn.—Under the inspiring leadership of Sqn. Ldr. Doe, his squadron has attained a high standard of operational efficiency. He has successfully completed numerous bombing and low-level attacks within 60 yards of our troops and over mountainous and difficult terrain. Whilst operating over the Arakan front his squadron has been responsible for the destruction of over 200 rivercraft, one tank, three bridges, six ferries and various other enemy objectives. Sqn. Ldr. Doe has completed his third tour of operational duty and has at all times displayed an unconquerable spirit and great devotion to duty.

Act. Sqn. Ldr. R. W. PEARSON, D.F.C., R.A.F., No. 140 Sqn. (Lt. The Green Howards).—This officer has completed two tours of operational duty, and since the award of the D.F.C. he has participated in numerous sorties. Both in the air and on the ground he has set a fine example by his leadership, skill and enthusiasm. In addition to his fine work in the air Sqn. Ldr. Pearson has been largely responsible for the practical perfection of night photography in Mosquito aircraft and its successful application to operations. The final results were only achieved after months of intensive work of trial and error. The result has been reflected in the high standard of efficiency which has been achieved during recent operations.

Air Comdre. C. E. Chilton, C.B.E., Assist. Air Officer in charge of Administration at H.Q. of Air Command, South East Asia.

Sqn. Ldr. R. D. MAY, R.A.A.F., No. 79 Sqn.—As a squadron commander this officer is a fearless leader and a good organiser. He has destroyed one enemy aircraft and damaged another. His courage, determination and devotion to duty have at all times set a fine example to those serving under him.

Act. Wing Cdr. G. N. B. SPARKS, R.C.A.F., No. 356 Sqn.—First as flight commander and later, as squadron commander, this officer has proved to be an outstanding leader, both in the air and on the ground. On operations his enthusiasm, skill and cheerful courage have set an inspiring example and have been reflected in the high standard of operational efficiency maintained in his squadron. Wing Cdr. Sparks' leadership has materially contributed to the successful completion of many missions flown by his squadron in formation and in single sorties.

Act. Sqn. Ldr. A. R. POOLE, D.F.C., R.A.F.V.R., No. 83 Sqn.—This officer commenced his operational career with an attack on Berlin in September, 1940, and since that date he has taken part in sorties against every type of target. Since the award of the D.F.C., he has flown on many missions with the Pathfinder Force, frequently encountering severe opposition. In October, 1944, his aircraft had been badly damaged by anti-aircraft fire while on a mission to Brunswick. Over Holland on the return flight, height was gradually lost and it was engaged by enemy searchlights. It was almost impossible to manœuvre the aircraft in its damaged condition, so Sqn. Ldr. Poole engaged and extinguished the searchlights, thus enabling the captain to fly the aircraft safely to base. As a squadron gunnery leader, this officer has achieved marked success. His work in training has been untiring and has raised the efficiency of his section to the highest level.

Flt. Lt. D. C. BUNCH, D.F.C., R.A.F.V.R., No. 157 Sqn.—This officer has a long and distinguished record of operational flying. Since the award of the D.F.C. he has completed a number of long range bomber support sorties. During these operations he has been largely responsible for the destruction of at least four enemy aircraft, bringing his total victories to at least ten enemy aircraft destroyed and others damaged. As navigation leader, by his tireless enthusiasm and ceaseless efforts, Flt. Lt. Bunch has done much towards raising the standard of the operators in his squadron. At all times, he has set an inspiring example by his efficiency, courage and devotion to duty.

Flt. Lt. J. C. COGILL, D.F.C., R.A.F.V.R., No. 192 Sqn.—This officer has completed a very large number of operational sorties. He has taken part in attacks on distant and heavily defended targets. Since being awarded the D.F.C. his high standard of courage and efficiency has been sustained and his enthusiasm for operational flying has in no way slackened. As a special operator, during his third tour of operational duty, Flt. Lt. Cogill has performed his difficult and

hazardous tasks with an extremely high degree of ability. All his sorties have been completed over highly defended areas. His devotion to duty has been outstanding.

Flt. Lt. R. J. COOK, D.F.C., D.F.M., R.A.F.V.R., No. 608 Sqn.—Flt. Lt. Cook has proved himself to be a most skilful and courageous operational pilot. He has recently completed a third tour of operational duty. His sorties have all been completed over enemy territory in Germany and occupied Europe, and heavy anti-aircraft defences have frequently been encountered. This officer took an effective part in the final prolonged bomber offensive against Berlin. Flt. Lt. Cook has operated continuously from the early days of the war till the present time. His many successes have made him a valuable asset to his squadron.

Badge of No. 249 Sqn., Royal Air Force—"Pugnis et Calcibus" (With fists and feet).

Flt. Lt. H. B. COOPER, D.F.C., R.A.F.V.R., No. 192 Sqn.—Now nearing the end of his third tour of operational duty, this officer has flown on numerous sorties since the award of the D.F.C. The majority of his missions have been against heavily defended targets. His great technical ability, cool skill and courage and steadfast devotion to duty have led him to be selected for most difficult and hazardous tasks. These Flt. Lt. Cooper has always accomplished with enthusiasm and outstanding efficiency.

Flt. Lt. F. J. GORRINGE, R.A.F.V.R., No. 617 Sqn.—This officer has operated continuously as a navigator since January, 1944, and has completed numerous operational missions. He took part in many attacks on such enemy centres as Nuremberg, Leipzig, Stuttgart and Berlin. During the bomber offensive which preceded the Allied occupation of Germany, Flt. Lt. Gorringe attacked both strategical and tactical targets, displaying magnificent courage, skill and endurance. Later, he took part in the sinking of the battleship *Tirpitz*. Throughout his operational career he has shown himself to be an outstanding navigator whose technical skill, great courage and consistent devotion to duty have largely contributed to the successes achieved by his crew.

Flt. Lt. W. G. NEAL, D.F.C., R.A.F.V.R., No. 156 Sqn.—This officer is a fine captain of aircraft who has a very good operational record. Since the award of the D.F.C. he has taken part in a large number of sorties, often in a most responsible role, and the success achieved in many of these missions has been largely due to his skill and courage. Flt. Lt. Neal has always pressed home his attacks with resolute determination. His skilful airmanship and coolness in hazardous situations have been of great value to his squadron.

Flt. Lt. G. H. NICHOLSON, D.F.C., R.A.F., No. 466 (R.A.A.F.) Sqn.—Flt. Lt. Nicholson has now completed his third tour of operational duty. He has flown both as air gunner and as flight engineer during his flying career and has invariably displayed outstanding skill and gallantry. On one occasion, when detailed to attack Essen, the port outer engine of his aircraft became unserviceable early on the outward flight. Acting on Flt. Lt. Nicholson's sound technical advice, the captain decided to fly on to the target, which was successfully bombed from a low level, although the aircraft was damaged by heavy anti-aircraft fire. As flight engineer leader of his squadron, this officer has accepted the most hazardous operational tasks with cheerful courage and coolness. Flt. Lt. Nicholson's knowledge of aircraft engines and engine handling is outstanding and his method of imparting it has been admirable. His skill and ability have been largely responsible for the high standards prevailing in his squadron.

Act. Flt. Lt. C. H. MATTHEWMAN, D.F.C., R.A.F.V.R., No. 109 Sqn.—Flt. Lt. Matthewman is an officer who has rendered very gallant and efficient service as a navigator. He has completed three tours of operational duty, and by his courage and fearlessness has earned the admiration of all in the squadron. By his sound knowledge of the equipment in use and by his very reliable navigation he has set a fine example. Many of his recent missions have been completed in the role of target marker on tactical targets—an arduous task which he has accomplished with fine results.

Act. Flt. Lt. S. WOODWARD, D.F.M., R.A.F.V.R., No. 223 Sqn.—This officer has completed a large number of operational sorties as captain of aircraft. He has recently completed a double tour of duty on bomber support duties during which he has set a fine example of courage and keenness. Flt. Lt. Woodward is a brilliant pilot and a fine leader. He has encountered severe enemy opposition over many of the most formidable targets on the continent of Europe. On several occasions his aircraft has been damaged by anti-aircraft fire. His great experience and his fine operational record have been worthy of the highest praise.

Sqn. Ldr. J. R. HENDERSON, D.F.C., R.A.A.F., No. 460 (R.A.A.F.) Sqn.—Throughout a large number of operational sorties this officer has displayed outstanding courage and devotion to duty. He has attacked some of the most heavily defended targets in Germany and, in the face of the enemy, his coolness and exceptional fearlessness has been worthy of the highest praise. On several occasions, Sqn. Ldr. Henderson has led both base and group formations in daylight operations over Germany, when his ability, skill and gallantry have inspired confidence in all.

Group Capt. W. F. M. NEWSON, D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.—This officer has a long and varied career of operational duty. After completing a tour of duty with Coastal Command in Canada, he was appointed to command a squadron in this country. He has taken part in many sorties, since the award of the D.F.C., many of them in a most important role. The success of a number of sorties against such heavily defended objectives as Chemnitz and Zweibrucken has been due in no small measure to his work as master bomber, Group Capt. Newson is an outstanding officer who by his keenness and efficiency has set a fine example.

Act. Wing Cdr. V. F. GANDERTON, D.F.C., R.C.A.F., No. 427 (R.C.A.F.) Sqn.—Wing Cdr. Ganderton has proved himself to be a most resourceful and skilful pilot who has successfully completed many hazardous attacks on highly defended targets in enemy territory. During an attack on Julich in November, 1944, one engine of his aircraft became unserviceable before crossing the French Coast but, despite this handicap, he continued his mission and pressed home the attack successfully. On other occasions Wing Cdr. Ganderton has completed dangerous missions on three engines. His aircraft has been damaged by anti-aircraft fire on several sorties, but he has always succeeded in returning safely to base. He has led his squadron with distinction during his second tour of operations, and his fine example in the face of the enemy has been an inspiration to all serving under him.

Act. Wing Cdr. T. W. HORTON, D.F.C., R.N.Z.A.F., No. 105 Sqn.—Since the award of the D.F.C., Wing Cdr. Horton has completed a large number of operational sorties. At all times he has shown great skill as a pilot and, more recently, sound judgment and fine leadership as a fight commander and deputy squadron commander. This officer has always shown great courage and determination in pressing home his attacks and has obtained some excellent results.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. L. G. NEILLY, D.F.C., R.C.A.F., No. 405 (R.C.A.F) Sqn.
Act. Sqn. Ldr. R. M. NEWITT, D.F.C., R.C.A.F., No. 550 Sqn.
Act. Sqn. Ldr. F. D. SMITH, D.F.C., R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. G. C. J. VANN, D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Flt. Lt. A. W. BATCHELOR, D.F.C., R.C.A.F., No. 109 Sqn.
Flt. Lt. A. A. A. H. J. DUCHESNAY, D.F.C., (R.C.A.F.) No. 426 Sqn.
Flt. Lt. W. K. NAYLOR, D.F.C. R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Flt. Lt. V. ROLFE, D.F.C., No. 424 (R.C.A.F.) Sqn.
Flt. Lt. L. H. WILLIAMS, D.F.C., R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Act. Flt. Lt. R. McM. FERGUSON, D.F.C., R.C.A.F., No. 405 (R.C.A.F) Sqn.
Act. Flt. Lt. A. B. HAMMOND, D.F.C., R.C.A.F., No. 139 Sqn.
Act. Flt. Lt. K. G. ORMAN, D.F.C., R.N.Z.A.F., No. 186 Sqn.
F/O. A. J. MUIR, D.F.C., R.N.Z.A.F., No. 7 Sqn.

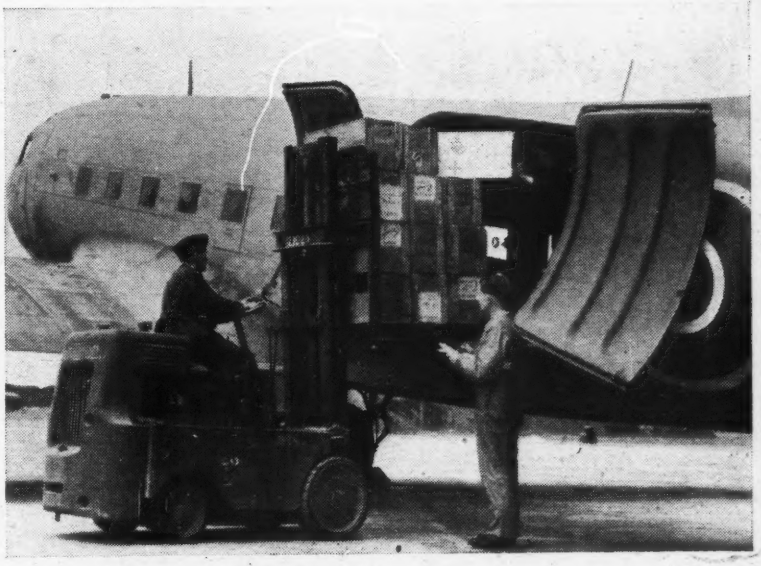
Distinguished Flying Cross

Act. Flt. Lt. L. J. HAY, R.A.F.V.R., No. 49 Sqn.
Act. Flt. Lt. A. HODSON, R.A.F.V.R., No. 10 Sqn.
Act. Flt. Lt. D. F. NEWHAM, R.A.F.V.R., No. 10 Sqn.
Act. Flt. Lt. S. A. NUNNS, R.A.F.V.R., No. 630 Sqn.
Act. Flt. Lt. E. PHILLIPS, R.A.F.V.R., No. 10 Sqn.
Act. Flt. Lt. H. THOMPSON, R.A.F., No. 630 Sqn.
Sqn. Ldr. E. G. BROAD, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Flt. Lt. E. V. GAVIN, R.A.A.F., No. 617 Sqn.
Act. Flt. Lt. R. B. BREUSCH, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Flt. Lt. A. E. BULLOCK, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Act. Flt. Lt. J. J. J. CROSS, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Act. Flt. Lt. R. S. FORGE, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Act. Flt. Lt. B. P. GILES, R.A.A.F., No. 15 Sqn.
Flt. Lt. J. D. BAIRD, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
Flt. Lt. A. W. BEALS, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Flt. Lt. F. BRUYNS, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
Flt. Lt. T. W. BUTTLE, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. R. M. GOULD, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. A. L. ROSS, D.F.M., R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Act. Flt. Lt. J. K. BAIN, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
Act. Flt. Lt. J. BEATON, R.C.A.F., No. 83 Sqn.
Act. Flt. Lt. M. L. BRUNTON, R.C.A.F., No. 77 Sqn.
Act. Flt. Lt. R. M. CROWTHER, R.C.A.F., No. 576 Sqn.
Act. Flt. Lt. H. P. GALARNEAU, D.F.M., R.C.A.F., No. 582 Sqn.
Act. Flt. Lt. D. G. HILL, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Act. Flt. E. E. HURLBUT, R.C.A.F., No. 77 Sqn.
Act. Flt. Lt. R. P. MCMILLAN, R.C.A.F., No. 420 (R.C.A.F.) Sqn.

Conspicuous Gallantry Medal (Flying)

W/O. L. E. GOSLING, R.A.F.V.R., No. 617 Sqn.—W/O. Gosling has operated continuously since December, 1943. He volunteered for two consecutive tours of duty and also to continue on operations after these tours had been completed. His record of attacks is outstanding. It has included missions against many of the most heavily defended targets in Germany. Those attacks called for a high standard of navigation, which W/O. Gosling has never failed to display. During the three attacks on the German battleship *Tirpitz*, in which he took part, he demonstrated his skill despite the long and arduous flights which were involved. The flight to the Russian base, from which the first attack was delivered, took place in appalling weather and, though his navigational aids were almost all unserviceable, he succeeded in directing his captain safely to base. W/O. Gosling's coolness and methodical and accurate work in the face of severe opposition has frequently enabled his captain to complete his sorties successfully.

W/O (now P/O.) A. PENROSE, D.F.C., R.A.F.V.R., No. 157 Sqn.—W/O. Penrose was awarded a bar to the D.F.C. in January, 1945. Since then he has completed a number of long-range bomber sorties of a difficult and dangerous nature. During these operations, this officer has



FREIGHTER: Loading Red Cross supplies into a Transport Command Dakota bound for the Far East, at R.A.F. Station, Lyneham.

SERVICE AVIATION

been largely responsible for the destruction of two Junkers 88s. W/O. Penrose has a splendid record of operations. He has assisted his captain in the destruction of ten enemy aircraft and six flying bombs. As a navigator, he has shown the highest degree of skill and determination. His ability and practical experience have been of the greatest value to his squadron.

Bar to Distinguished Flying Medal

Flt. Sgt. H. EVANS, D.F.M., R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. J. R. HUGHES, D.F.M., R.A.F.V.R., No. 582 Sqn.

Distinguished Flying Medal

Flt. Sgt. J. W. ADAMSON, R.A.F.V.R., No. 626 Sqn.
Flt. Sgt. M. W. A. ALLSOPP, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. H. W. BEER, R.A.F.V.R., No. 186 Sqn.
Flt. Sgt. A. G. HOWS, R.A.F.V.R., No. 153 Sqn.
Flt. Sgt. R. A. JOHNSTONE, R.A.F.V.R., No. 103 Sqn.
Flt. Sgt. A. T. JONES, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. K. F. JUDD, R.A.F.V.R.R., No. 35 Sqn
Flt. Sgt. W. D. H. HOSKIN, R.A.F.V.R., No. 51 Sqn.

(Left) Badge of No. 6 Sqn., Royal Air Force—"Oculi Exercitus" (Eyes of the Army). (Right) Badge of R.A.F. Station, Exeter—"Ex Aeterna Vigilantia Vives" (From Everlasting Watchfulness (comes) Strength).

Roll of Honour

Casualty Communiqué No. 543.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 182 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. G. E. Ames; F/O. M. Austin; Sgt. R. E. Black; Flt. Lt. C. A. Chew, A.F.C.; F/O. E. Cook; W/O. E. A. Day; Flt. Sgt. G. R. Douglas; Sgt. C. Ellerington; F/O. G. G. Hayes; Sgt. W. Hayman; Flt. Lt. W. Knowles, D.F.C.; Flt. Lt. C. J. Maltby; F/O. R. S. Martin, D.F.C.; W/O. G. C. Newman; Sgt. T. J. A. Stevens; Flt. Sgt. L. Thomas; Act. Sqn. Ldr. G. O. S. Whitty, D.F.C.; W/O. J. G. J. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. Chalmers, D.F.M.; Flt. Sgt. J. E. Cowan, D.F.M.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. G. H. Agar, D.F.M.; Sgt. D. G. Allen; Flt. Sgt. H. G. Andrews; Sgt. H. E. Arbon; Flt. Lt. H. L. Ashman; Flt. Sgt. R. E. L. Askie; Sgt. H. Austin; F/O. R. Avery; Sgt. R. Bailey; Flt. Sgt. A. R. Barber; Flt. Sgt. E. W. Bark; Sgt. C. J. Baynes; Sgt. A. M. Berry; Sgt. J. Binnie; Sgt. J. E. Boswell; P/O. J. H. Booth; Sgt. L. W. Brierley; Sgt. J. Brining; P/O. J. A. Brooks; Sgt. B. MacC. Catley; Act. F/O. R. Cave; Sgt. K. E. Chandler; F/O. D. M. Cleeve; Flt. Sgt. G. E. Coe; P/O. J. Colvin; Sgt. T. W. Connor; Sgt. E. C. Cottrell; Act. Flt. Lt. G. C. Crew, D.F.C.; Sgt. E. A. Davis; Flt. Sgt. S. E. Dunnett; F/O. J. R. Dyer; Sgt. R. G. Evans; Sgt. C. L. Finighan; Sgt. F. C. Foster; Sgt. H. Foy; Sgt. F. S. Freeman; Sgt. P. Friel; Sgt. D. C. Gallagher; Sgt. H. Gee; Sgt. D. Gemmell; Sgt. H. Goldberg; Wing Cdr H. R. Goodman; P/O. K. Goodwin; Sgt. W. McM. Green; Sgt. C. P. Greenslade; Sgt. D. B. Haig; Sgt. J. F. C. Halliwell; Sgt. K. B. Harding; Flt. Sgt. H. Hardy; Sgt. R. D. A. Harmsworth; Sgt. J. Harrison; Flt. Sgt. J. Hayhurst; Sgt. J. D. Haywood; F/O. D. B. F. Heslop, D.F.C.; P/O. L. W. Hetherington; Flt. Sgt. W. Houghton; Sgt. E. F. Hudson; Flt. Sgt. D. Hughes; Flt. Sgt. L. W. Hughes; F/O. P. M. Hughes; Flt. Sgt. A. F. Humphrey; P/O. A. E. Jackson; P/O. R. W. Johnson; Sgt. W. A. Jones; Flt. Sgt. H. M. Kent; Flt. Sgt. H. A. King; P/O. M. Livesey; Sgt. E. Lockey; Sgt. W. Low; Sgt. J. D. MacPherson; F/O. J. C. Marland; P/O. D. C. H. Maxwell; Sgt. A. J. Mitchell; Sgt. R. A. Moore; Flt. Lt. F. Mountain; Flt. Lt. R. M. Muir, D.F.C.; Sgt. J. C. Murphy; Flt. Sgt. W. T. N. Norris; Flt. Sgt. A. Notley; Sgt. A. D. Poole; Flt. Sgt. H. G. Pratt; Sgt. R. W. Randall; Act. Sqn. Ldr. A. W. Raw, D.F.C., A.F.C.; F/O. A. H. Redman; Act. Flt. Lt. C. W. Reeves; Flt. Sgt. A. G. Rhodes; Flt. Sgt. W. H. Riding; Flt. Sgt. D. Robertson; F/O. J. H. Rosbottom; Sgt. C. H. Ross; P/O. J. Ross; Sgt. W. J. Saxby; F/O. R. J. Shaw; Sgt. J. R. Sissons; Sgt. A. S. Smith; Flt. Sgt. W. K. Steedman; Sgt. C. Stephenson; Sgt. A. A. Taylor; Flt. Sgt. W. Taylor; Sgt. J. Terry; Flt. Sgt. W. H. Thompson; P/O. D. S. Tointon; Act. Sqn. Ldr. G. A. R. Undrell, D.F.C.; P/O. P. D. Vickers; Sgt K. N. Ward; P/O. L. T. Watson; Act. F/O. E. Westgate; Sgt. D. J. White; F/O. A. J. Wilcox.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—F/O. E. R. Goddard; Flt. Sgt. A. Griffiths; Flt. Sgt. J. G. Jeffery; Sgt. D. W. Medlicott; Flt. Lt. A. J. Rippon.

WOUNDED OR INJURED IN ACTION.—W/O. D. E. Helmore.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. D. J. Carter; Flt. Sgt. A. A. Chapman; Flt. Lt. A. McLeod, D.F.C.; F/O. B. T. Smyth; W/O. F. N. Wheeley.

MISSING.—Flt. Sgt. W. G. Allingham; Flt. Sgt. M. Barrett; F/O. H. Benson, D.F.C.; F/O. A. H. Bobbett; Sgt. S. D. Booth; Flt. Sgt. P. Bradley; Flt. Sgt. F. C. Brenner; W/O. P. S. Brinkworth; Flt. Sgt. J. Brown; Sgt. W. J. Charles; F/O. L. A. Cox; Sgt. W. D. Dale; Sgt. J. A. Elliott; Sgt. J. McG. Fletcher; Act. Flt. Lt. J. T. Flower; Sgt. R. W. Fyfton; Flt. Sgt. J. C. Gilbertson-Pritchard; Sgt. R. Goldsbury; Flt. Sgt. H. Gravett; Sgt. K. C. Hayward; Flt. Lt. A. W. Huckle; Sgt. L. H. Joel; Sgt. W. C. E. Joyce; Sgt. A. Kircaldy; Flt. Sgt. K. W. Linney; Flt. Sgt. E. S. Lloyd; P/O. S. McKaig; Sgt. L. Marshall; Flt. Sgt. F. W. Matthews; Flt. Sgt. D. F. Miller; Sgt. A. G. Mitchell; Flt. Sgt. K. A. L. Mitchell; Sgt. J. T. Nicholls; Sgt. D. Parker; F/O. D. Peat; Sgt. W. Perkins; P/O. W. E. C. Ralph; F/O. H. W. Ricketts; Flt. Sgt. R. J. Sleigh; Sgt. R. P. Smith; Flt. Sgt. P. E. Thomas; Flt. Lt. R. R. Trevor, D.F.C.; Flt. Sgt. G. Wainwright; W/O. D. R. Whiskin; Sgt. J. P. Williams; Sgt. J. R. Williams; Flt. Lt. J. R. Williams; P/O. H. Woolstenhulme; P/O. E. Y. Yeoman.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. F. C. Aldersley; Sgt. O. Aston; Sgt. D. A. Bates; F/O. W. D. Cheyne; P/O. A. F. Ceeley; P/O. P. Cooke; Flt. Sgt. N. Davis; F/O. D. Dixon; Flt. Sgt. R. Dormer; Sgt. R. J. Edge; Flt. Sgt. R. Goddard; Flt. Sgt. J. G. W. Harcourt; Cpl. J. Hardy; Sgt. R. S. P. Hook; F/O. C. A. J. Honey; Flt. Lt. W. J. Howes; P/O. K. R. Inger; Flt. Sgt. R. H. McAlpine; Sgt. P. McNeilly; F/O. W. G. Munday; F/O. M. E. P. Naylor; F/O. W. H. Paul; Flt. Sgt. S. A. Pimm; Flt. Sgt. F. W. Rees; Sgt. S. E. Robinson; F/O. S. F. B. Sargent; Sgt. K. Slee; F/O. J. Williams; Flt. Sgt. R. MacL. Wilson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. R. G. Collingham; Sgt. A. Eland.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—L.A/C. R. Thurman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. S. Anson; Sgt. P. N. Colman; Sgt. S. Edwards; L.A/C. W. F. Micklewright; Sgt. J. Newton; Sgt. A. M. Morris; Cpl. W. E. Saunders; A/C.1 A. R. Vickers.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.2 L. Rogers.

DIED ON ACTIVE SERVICE.—Sgt. H. K. Hurst; Cpl. L. C. A. Jones; L.A/C. T. B. Knight; L.A/C. R. Miller; A/C.2 D. G. Stewart.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. K. F. Grogan; P/O. R. A. J. McDougall.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. S. W. Newman; W/O. A. T. Till; P/O. R. H. Watts.

MISSING.—W/O. G. G. Allman; Flt. Sgt. V. J. Arnold; Flt. Sgt. G. S. Barbeler; Flt. Sgt. R. F. L. Barber; P/O. C. Campbell; F/O. I. L. Felgate; P/O. W. H. Hulme; W/O. J. Hyde; Flt. Sgt. C. H. Irving; W/O. W. A. Neill; F/O. W. H. Pitts.

KILLED ON ACTIVE SERVICE.—F/O. A. J. Pryde.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. A. P. Bell.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. E. K. Bullock; F/O. R. L. Sleeth.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Cpl. J. E. Allen; F/O. L. E. Anderson; L.A/C. L. I. Beach; L.A/C. O. E. D. Bergen; F/O. G. T. Bolderston; Flt. Sgt. C. J. Brady; F/O. G. G. Bryan; L.A/C. R. T. Burden; Cpl. W. H. Campbell; Flt. Sgt. E. K. Carlson; P/O. H. W. T. Carter; Flt. Sgt. A. R. Chalmers; L.A/C. J. A. R. Chevrier; F/O. A. T. Clark; Flt. Sgt. J. F. W. Clarke; L.A/C. J. R. M. A. Couturier; F/O. V. Crawford; Cpl. J. Cumming; F/O. G. D. Danielson; Flt. Lt. C. E. Darby, D.F.M.; F/O. J. M. Dunsmuir; Flt. Lt. A. P. Forbes; L.A/C. F. R. Gates; L.A/C. M. J. F. Good; F/O. T. Gorak; P/O. L. G. Hardy; P/O. W. J. Hope; Sgt. W. F. Hughes; Cpl. H. J. Hunter; P/O. A. R. Jackson; P/O. L. K. Johnson; F/O. B. I. Kalheim; L.A/C. F. L. Kristensen; F/O. A. W. Larsen; F/O. J. E. G. Le Blanc; P/O. H. J. Linn; P/O. H. W. Lugg; L.A/C. W. J. S. Lundy; P/O. D. R. MacCarthy; L.A/C. D. J. MacDonald; P/O. H. L. McKay; F/O. S. A. MacKenzie; P/O. K. A. McLaughlin; P/O. A. S. McLean; P/O. R. H. McNabb; A/C.1 J. D. McVie; Cpl. L. H. Moreau; F/O. J. R. Potts; Flt. Sgt. T. A. Purvis; Cpl. F. W. Sargeant; P/O. H. I. Shepherd; Flt. Lt. B. H. Smith; L.A/C. J. C. Sutherland; L.A/C. H. S. Watson.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. W. T. Maltby.

KILLED ON ACTIVE SERVICE.—F/O. R. H. Appleyard; F/O. M. MacD. Gardner; F/O. E. F. Gilbert; F/O. W. E. H. O'Bryan.

MISSING.—Flt. Sgt. J. P. H. Adam; W/O. R. M. Baker; Flt. Sgt. L. E. Baxter; Flt. Sgt. W. G. Brown; F/O. R. S. Butterworth; P/O. H. MacK. Carter; F/O. L. C. Croucher; F/O. W. G. Cunningham; F/O. D. N. Donald; Flt. Sgt. C. A. Elliott; W/O. F. E. Gray; Flt. Sgt. G. F. Greenlee; Flt. Sgt. D. L. Haberthur; F/O. E. Hayes; F/O. R. V. Kingdon; F/O. R. W. Millar; F/O. A. J. Palanek; Flt. Sgt. J. W. Paterson; F/O. A. G. E. Peaker; W/O. J. W. Pelant; Flt. Sgt. E. F. Perrault; F/O. G. S. Ragan; F/O. T. C. Reeve; P/O. W. A. Routley; Flt. Lt. H. B. Rubin; F/O. W. F. Stafford; Flt. Lt. W. M. Tree; Flt. Lt. W. A. Walton; W/O. R. G. Wilson.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. A. Gawith; F/O. J. W. Walters; W/O. J. L. T. Williams, D.F.M.

MISSING.—Flt. Sgt. C. A. Thomas.

KILLED ON ACTIVE SERVICE.—F/O. W. I. Holmes.

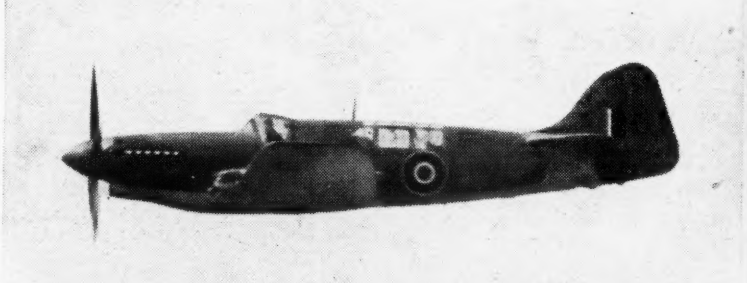
South African Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Lt. W. A. Gale.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—2/Lt. L. L. Van Dyk.

MISSING.—2/Lt. L. De Klerk.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. M. Gerson; W/O. W. G. Jones; Lt. C. Ross.



CLEANED UP: The Firefly IV was one of the new Naval types recently displayed at Heston. This version has a redesigned fin and rudder, and clipped wings, and is fitted with a Griffon 74 engine, with wing-root radiators.